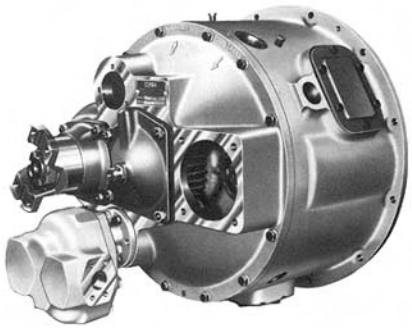
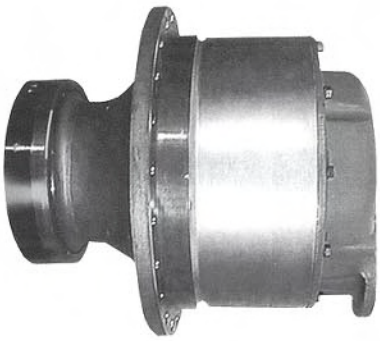
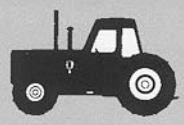
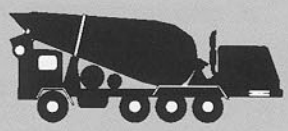
2050 Series
Posi-Torq - Limited Slip Differential
Reference 21D and 53R Axle Series
#0097

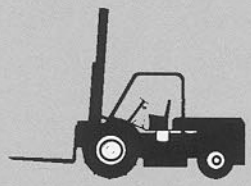
Allied Systems Form #80-854











SPICER OFF-HIGHWAY COMPONENTS

DANA

FOREWORD

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the **CLARK-HURTH COMPONENTS** product.

Extreme care has been exercised in the design, selection of materials, and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated will be reimbursed many times in low cost operation and trouble free service.

In order to become familiar with the various parts of the product, its principle of operation, troubleshooting, and adjustments, it is urged that the mechanic study the instructions in this manual carefully and use it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts is required, only **Clark-Hurth Components**-approved parts as listed in the applicable parts manual should be used. Use of "will-fit" or non-approved parts may endanger proper operation and performance of the equipment. **Clark-Hurth Components** does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied by or approved by **Clark-Hurth Components.** IMPORTANT: **Always furnish the Distributor with the serial and model number when ordering parts.**

DESCRIPTION OF
THE LIMITED SLIP HIGH TORQUE BIAS DIFFERENTIAL

The Clark-Hurth POSI-TORQ limited slip differential is designed to prevent the severe loss of traction which occurs when one (1) wheel encounters adverse tractive conditions such as slippery, wet, muddy conditions and the uneven terrain often encountered in off-road vehicle operations. This terrain can cause the vehicle to become immobile because of the spinning of one (1) wheel.

The Clark-Hurth POSI-TORQ differential uses clutch plates (which may optionally be spring loaded) to inhibit spinning and send torque to the high-traction wheel. With the spring loaded POSI-TORQ, the wheel with the best traction can have up to five (5) times the torque of the wheel with poor traction (5:1 bias ratio) at low torque levels. The use of clutches in the differential provides high torque bias while maintaining a smooth differential action. This eliminates the drive line shock inherent in locking type differentials.

FEATURES:

- Increases traction in adverse driving conditions over a standard differential.
- Reduces tire wear.
- Eliminates shock loadings caused by locking differentials.
- Improves steering over a locking differential.
- Directs torque away from a slipping wheel to the wheel with the most traction.
- Provides up to five (5) times the torque to the tractive wheel as to the slipping wheel at low torque levels.
- Uses a quiet four (4)-pinion gear differential with each pinion backed by a replaceable thrust washer to reduce maintenance costs.
- Available in two (2) versions — without springs and with springs depending on application requirements.
- Available on many Clark-Hurth axle models.

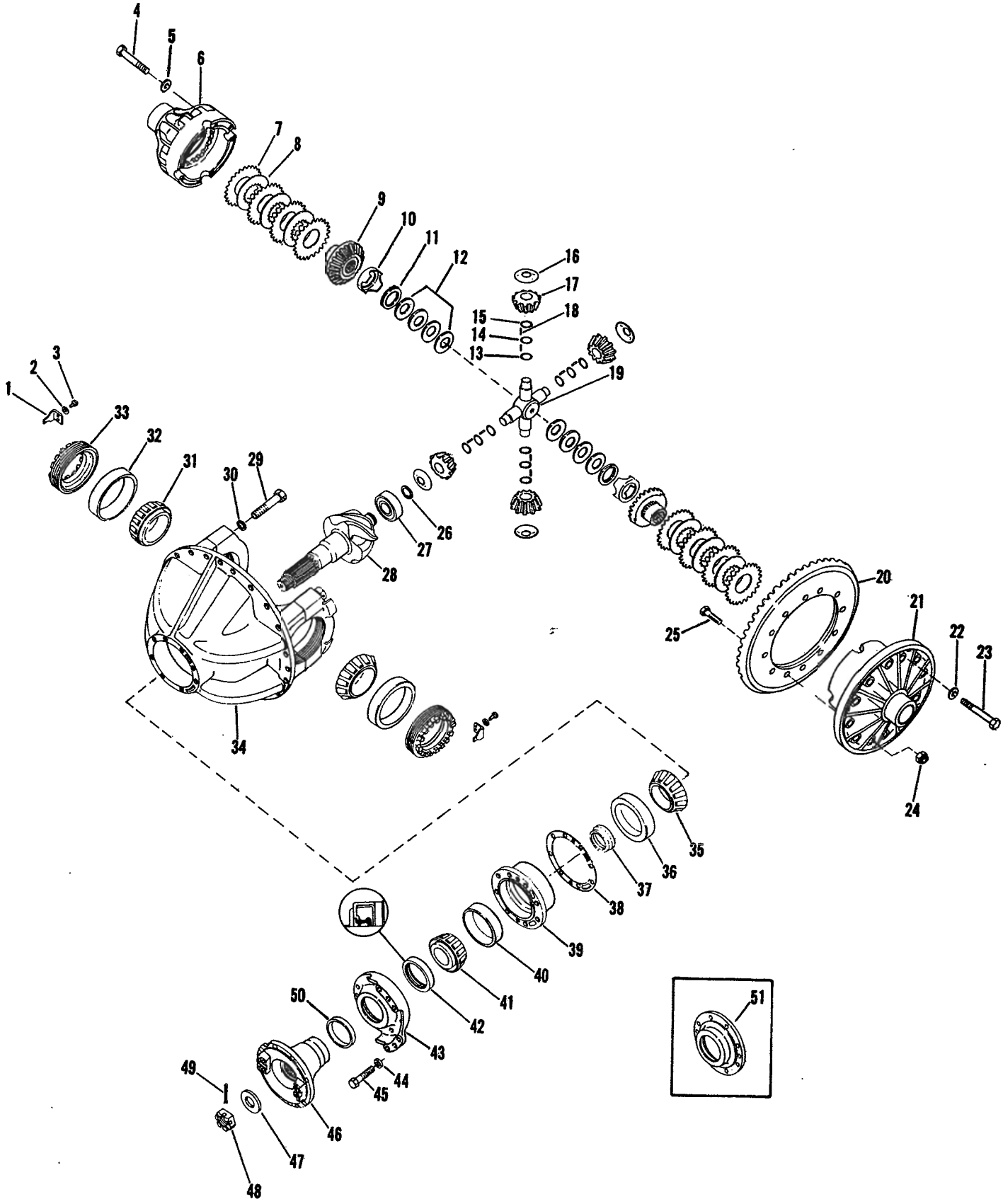

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Figure A

2050 POSI-TORQ
DIFFERENTIAL AND CARRIER ASSEMBLY

ITEM	DESCRIPTION	QTY.
1	Differential Adjusting Nut Lock	2
2	Nut Lock Capscrew Lockwasher	2
3	Adjusting Nut Lock Capscrew	2
4	Differential Case Bolt	4
5	Differential Case Bolt Washer	4
6	Differential Plain Half Case	1
7	Outer Clutch Disc	8
8	Inner Clutch Disc	6
9	Differential Side Gear	2
10	Thrust Plate	2
11	Spring Spacer (select at assembly)	2
12	Spring Pack	2
13	Inner Spacer	4
14	Middle Spacer	4
15	Outer Spacer	4
16	Pinion Gear Thrust Washer	4
17	Differential Pinion Gear	4
18	Needle Roller	216
19	Pinion Gear Cross	1
20	Ring Gear	1
21	Flange Half Case	1
22	Differential Case Bolt Washers	8
23	Differential Case Bolt	8
24	Ring Gear Bolt Nut	12
25	Ring Gear Bolt	12
26	Inner Pinion Bearing Retainer Ring	1
27	Inner Pinion Bearing	1
28	Pinion	1
29	Carrier Cap Capscrew	4
30	Carrier Cap Lockwasher	4
31	Differential Bearing Cone	2
32	Differential Bearing Cup	2
33	Differential Adjusting Nut	2
34	Differential Carrier	1
35	Center Pinion Bearing Cone	1
36	Center Pinion Bearing Cup	1
37	Pinion Bearing Spacer	1
38	Pinion Bearing Cage Shim	AR
39	Pinion Bearing Cage	1
40	Outer Pinion Bearing Cup	1
41	Outer Pinion Bearing Cone	1
42	Pinion Oil Seal	1
43	Oil Seal Retainer	1
44	Retainer Capscrew Lockwasher	8
45	Retainer Capscrew	8
46	Universal Joint Flange	1
47	Pinion Shaft Nut Washer	1
48	Pinion Shaft Nut	1
49	Pinion Shaft Nut Cotter	1
50	Wear Sleeve	1
51	Oil Seal Retainer (option)	1

A.R. As Required

Recommended Lubricants for Clark-Hurth Drive Axles

Initial Fill

Grade 85W140 qualified MIL-L-2105C gear lubricant as specified in Clark MS-8 engineering standard is preferred fo initial fill for most ambient temperatures. (See chart below) For other ambient temperature ranges, use proper viscosities o MIL-L-2105C.

Other lubricants approved to MIL-L-2105C specifications are acceptable for initial fill or top off.

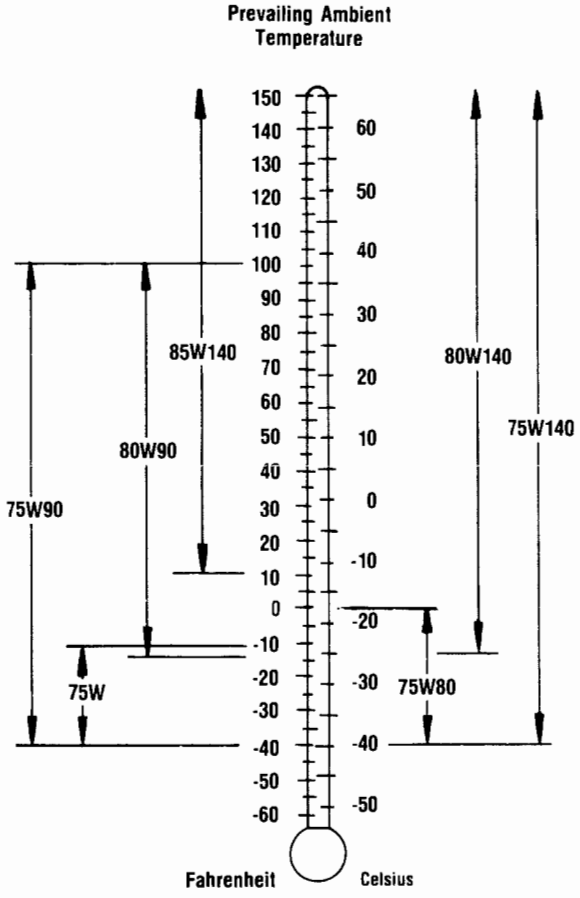
Service Fill

Multipurpose gear lubricants approved to the MIL-L-2105C specifications are recommended.
MIL-L-2105C classifies multigrade gear lubricants on the basis of their viscosities at various temperatures.

Listed below are the recommended multigrade viscosities for use at the prevailing operating temperatures in Clark-Hurth Drive Axles.

MS-8 Extreme Pressure Gear Lubricant

MS-8 specifications covers a gear lubricant for use in heavy-duty axles. It is a highly refined base stock properly compounde with selected extreme pressure additives. MS-8 meets MIL-L-2105C but is fortified with an additive package that provides adde protection during the break-in period and reduced wear and improved efficiency during subsequent operation.



For proper viscosity lube, refer to fahrenheit or celsius chart below.

Gear Lubricant Chart

Ambient Temperature Ranges				Multigrade Viscosities MIL-L-2105C
				See (a) note below.
-40°F	to	-10°F	(-40°C to -23°C)	75W See (b) note below.
-40°F	to	0°F	(-40°C to -18°C)	75W80
-40°F	to	+100°F	(-40°C to -38°C)	75W90
-40°F	+	Above	(-40°C + Above)	75W140
-15°F	to	100°F	(-26°C to 38°C)	80W90
-15°F	+	Above	(-26°C + Above)	80W140
+10°F	+	Above	(-12°C + Above)	85W140

Notes:

(a) The MIL-L-2105C Specification replaced the MIL-L-2105B Specification

(b) The MIL-L-2105C 75W Classification replaced the MIL-L-10324A Subarctic Specification.

Note: Specifications are subject to change.

Figure B

POSI-TORQ 2050 SERIES
LIMITED SLIP DIFFERENTIAL AND CARRIER ASSEMBLY
(with springs — optional)

Notes:
Grease seal seat journal of drive flange with E.P. Multi Purpose Grease Grade #2 prior to assembly.

Apply coating of E.P. Multi Purpose Grease Grade #2 between lips of oil seals.

Boss provided on carrier has Serial No. & Carrier Ratio.

△1 Apply Loctite #262 Thread Locking Compound.
At reassembly, apply thread locking compound where noted,
Guidlines for application—Where to apply:
A. On bolts, cap screws and studs (anchor end) apply compound on female threaded component part,
B. On nuts, apply compound to the male thread of the mating fastener.
C. Apply compound to coat the full length and circumference of thread engagement.
D. Remove excess compound from mating parts after fastener application.

△2 Apply Loctite #515 to shims and joining surfaces.

△3 Coat all clutch plates and side gear surfaces with Dow-Corning Molykote G-N paste.

△4 Apply Dow-Corning RTV-Q3-7069 Sealant.

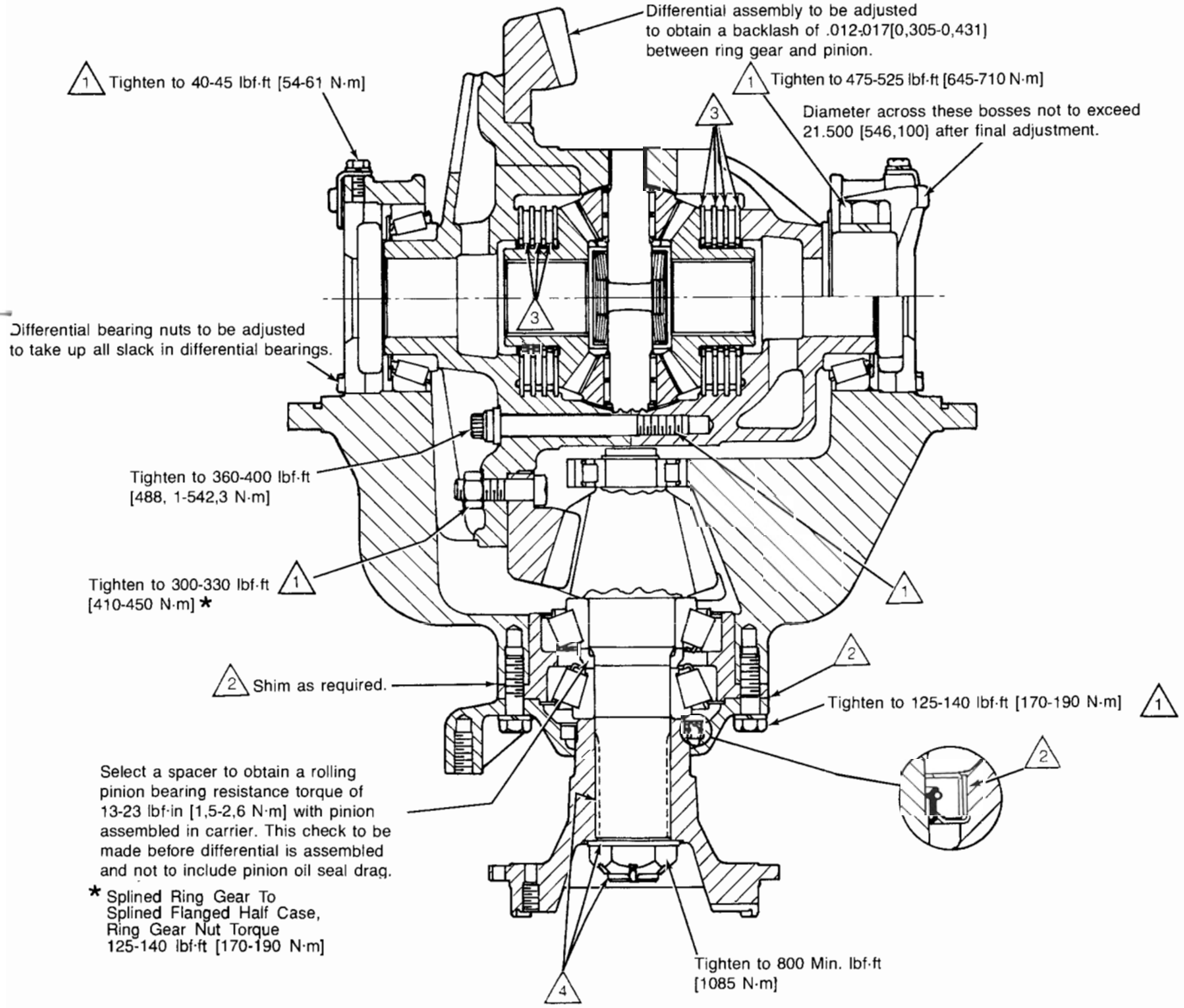
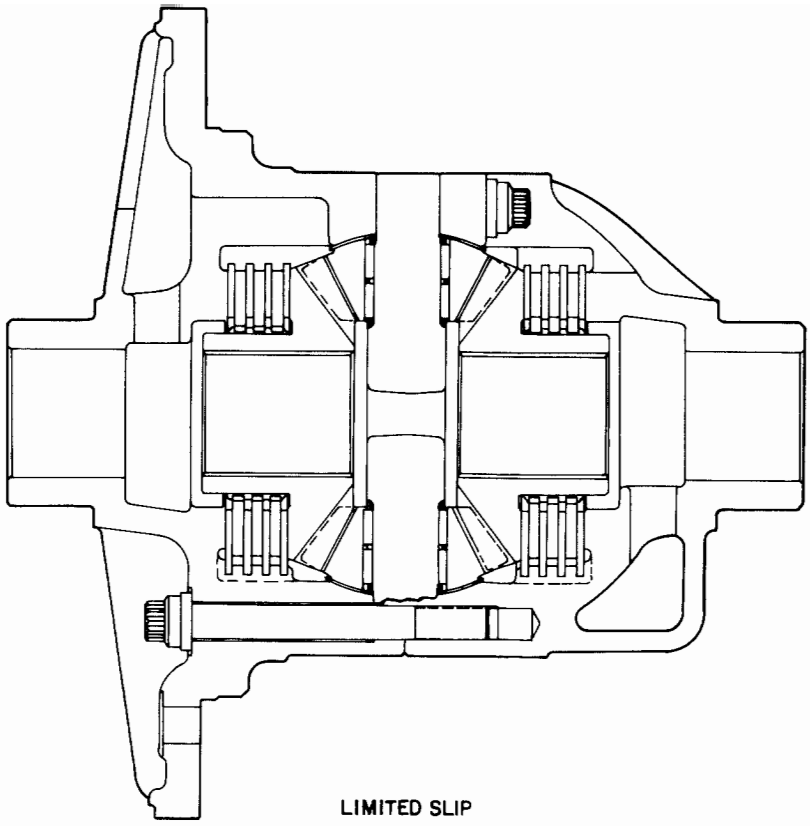
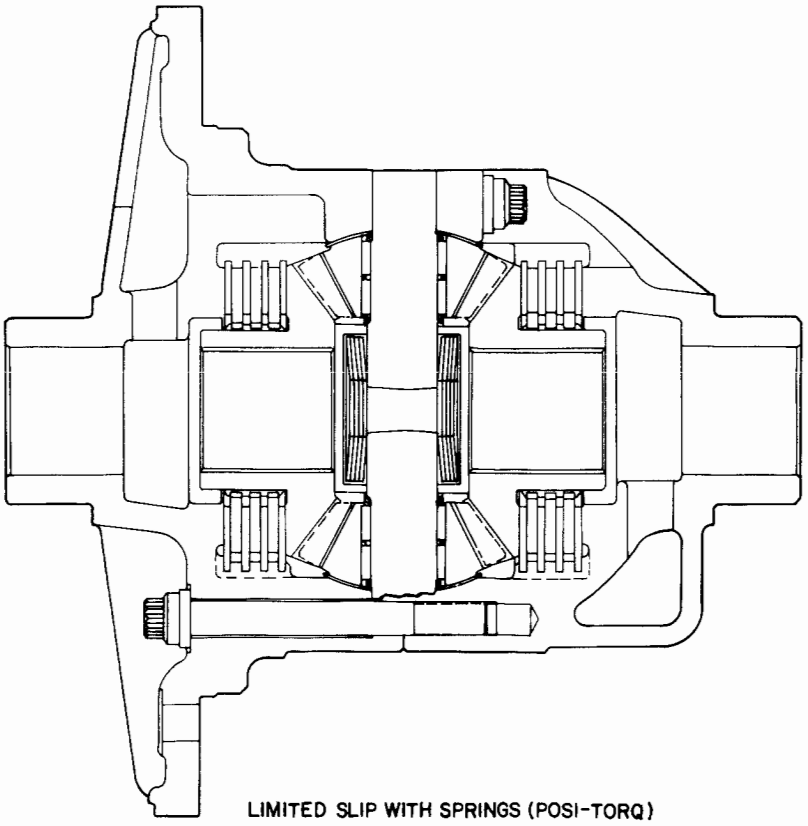


Figure C



LIMITED SLIP



LIMITED SLIP WITH SPRINGS (POSI-TORQ)

Figure D

DISASSEMBLY AND REASSEMBLY OF THE SPRING LOADED LIMITED SLIP HIGH TORQUE BIAS DIFFERENTIAL

The instructions contained herein cover the disassembly and reassembly of the differential assembly in a sequence that would normally be followed after the unit has been removed from the axle housing and is to be completely overhauled.

CAUTION: Cleanliness is of extreme importance in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

Note: Spring loaded differentials are optional. The differential shown in this text is spring loaded. Disassembly and reassembly are identical except where springs are shown.

DISASSEMBLY

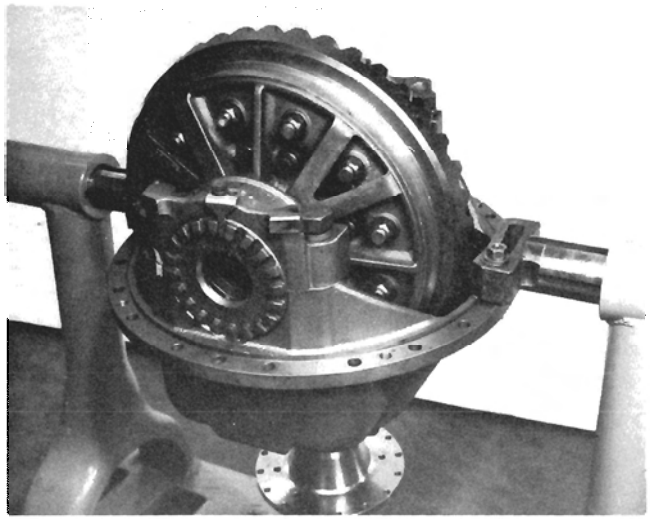


Figure 1
Mount differential on differential overhaul stand.

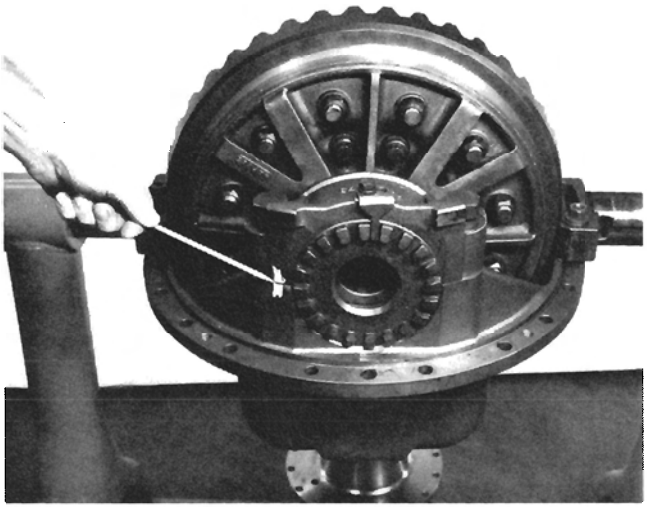


Figure 3
Mark carrier cap and carrier housing to insure correct match in reassembly.

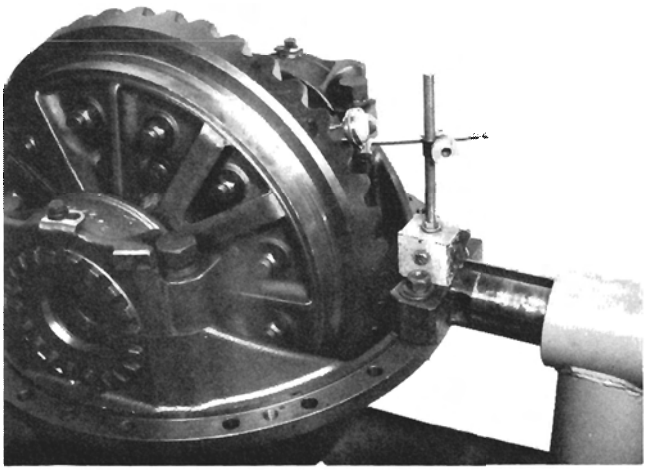


Figure 2
Check and record ring gear backlash with a dial indicator. This information is necessary for reassembly unless a new gear set is installed.

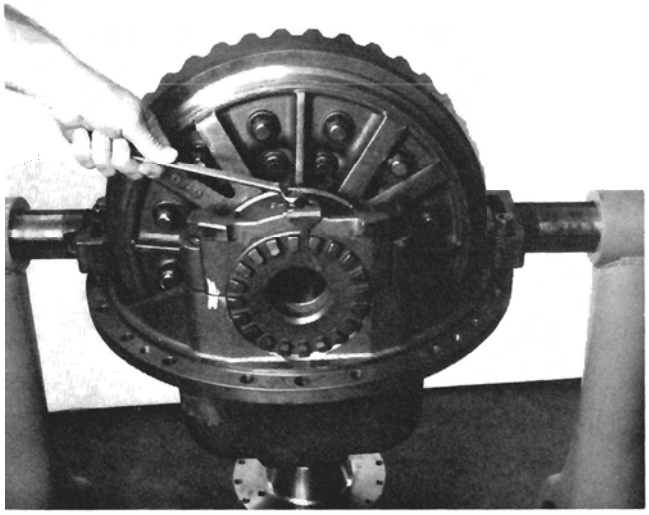


Figure 4
Remove adjusting nut lock capscrew and washer, both sides.

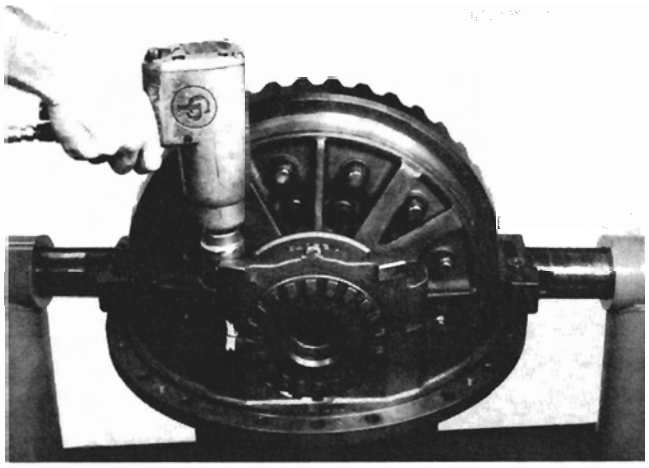


Figure 5
Remove carrier cap capscrews and washers on both sides.

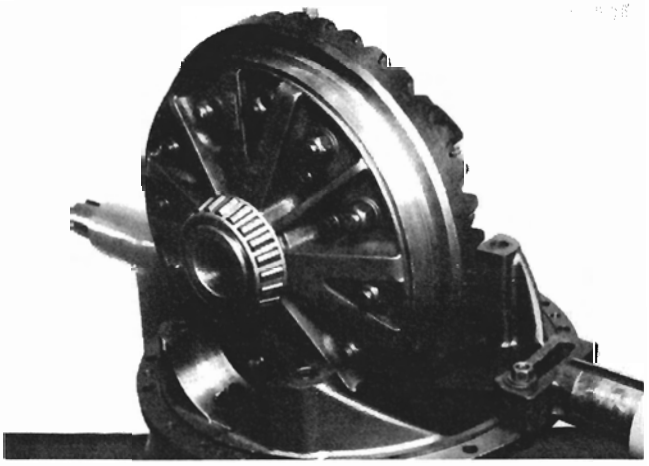


Figure 8
Remove differential assembly from carrier.

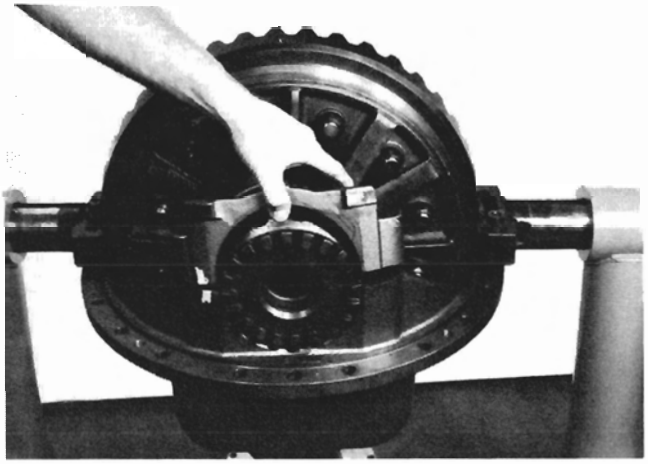


Figure 6
Remove carrier caps.

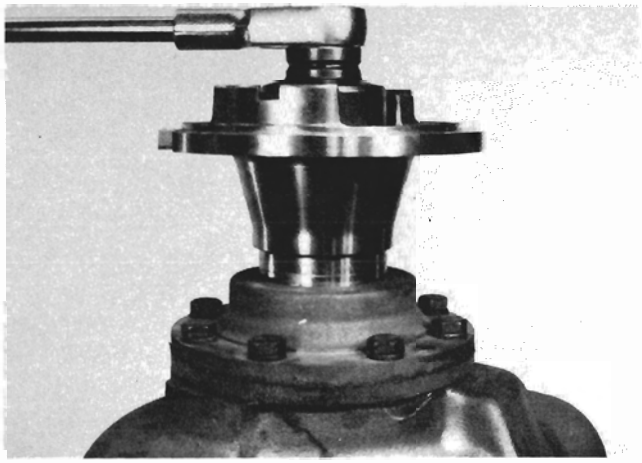


Figure 9
Remove companion flange nut.

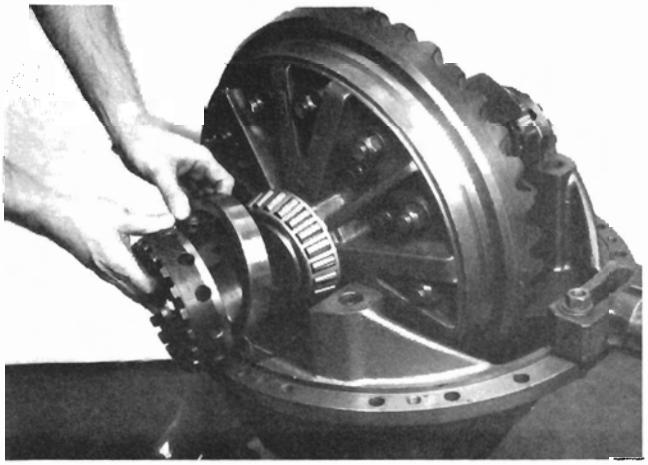


Figure 7
Remove adjusting nuts and taper bearing cups.

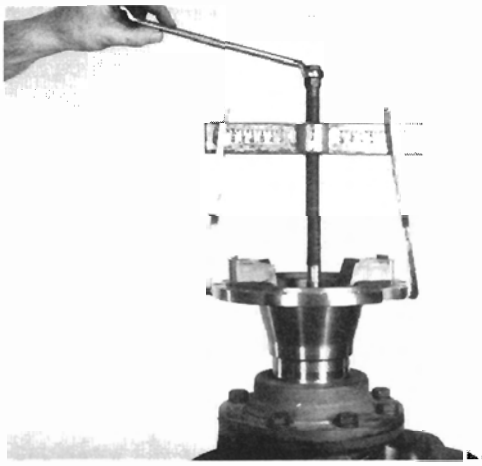


Figure 10
Remove flange.

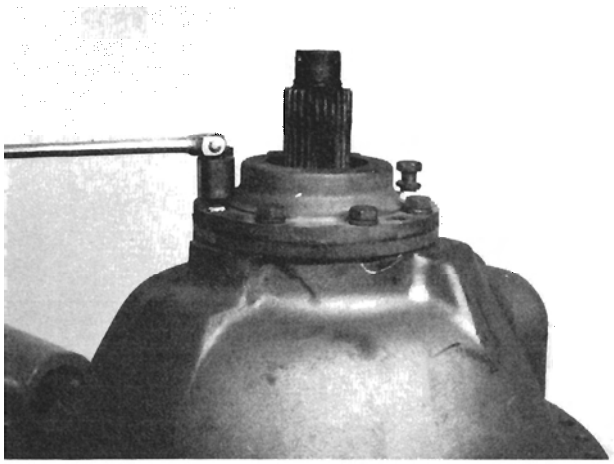


Figure 11
Remove oil seal retainer bolts.

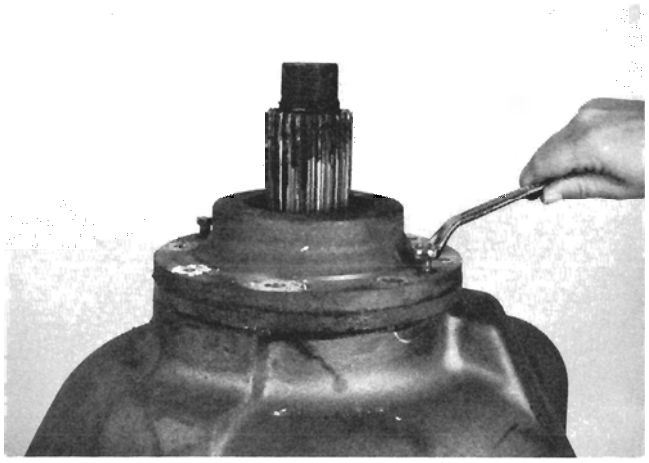


Figure 12
Use threaded holes and bolts to remove retainer.

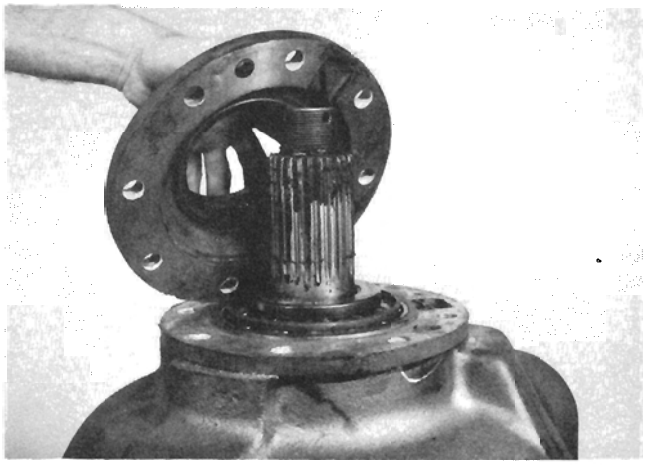


Figure 13
Remove oil seal retainer.

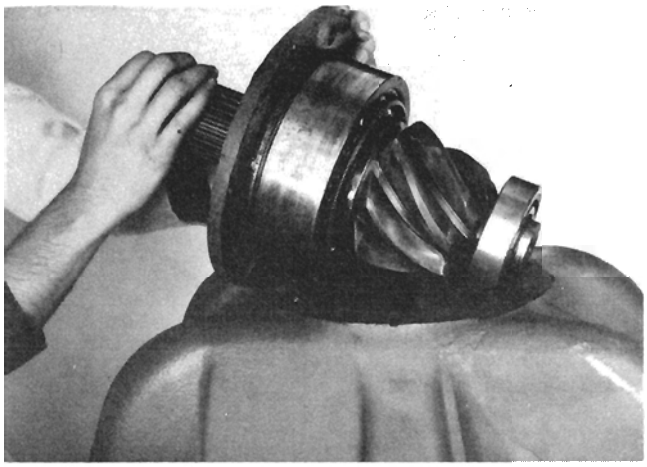


Figure 14
Remove pinion and bearing cage assembly. Retain shim pack for possible reuse at reassembly.

PINION AND BEARING CAGE DISASSEMBLY

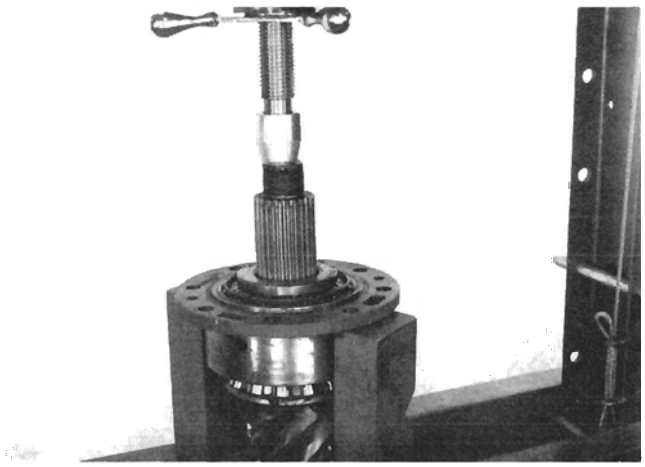


Figure 15
Press pinion shaft and center bearing from outer bearing and bearing cage.

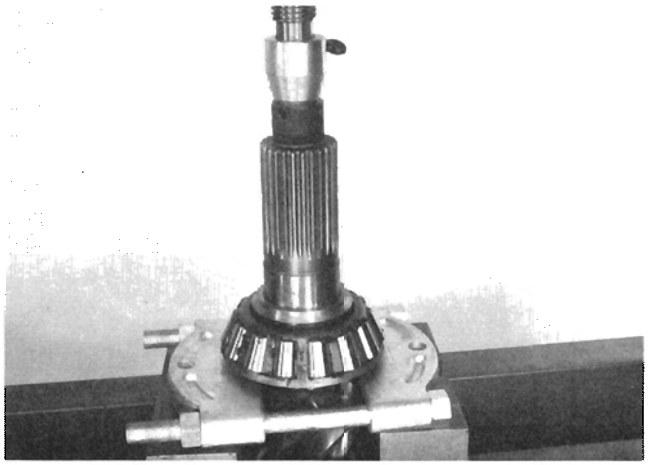


Figure 16
Press center bearing from pinion shaft.

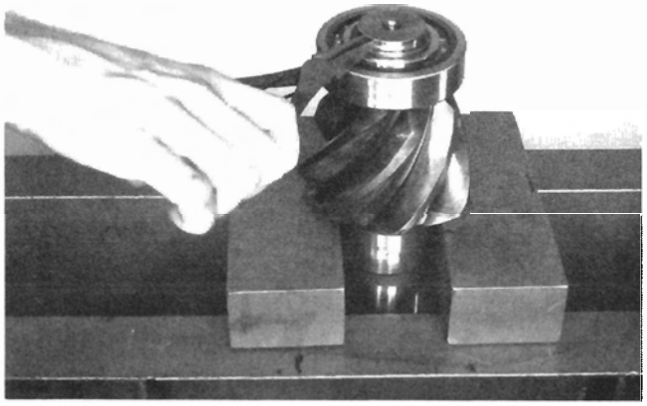


Figure 17
Remove inner pinion bearing retainer ring.

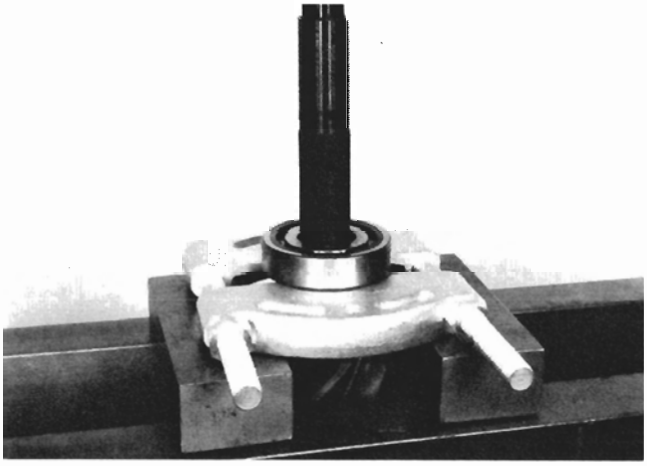


Figure 18
Press inner bearing from pinion shaft.

Figure 19
Remove pinion bearing cups only if they are to be replaced or if the bearing cage is damaged.

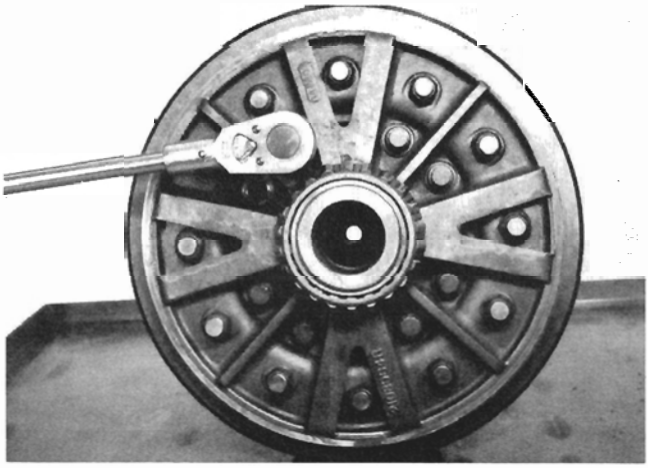


Figure 20
Remove body bolts from flange half.

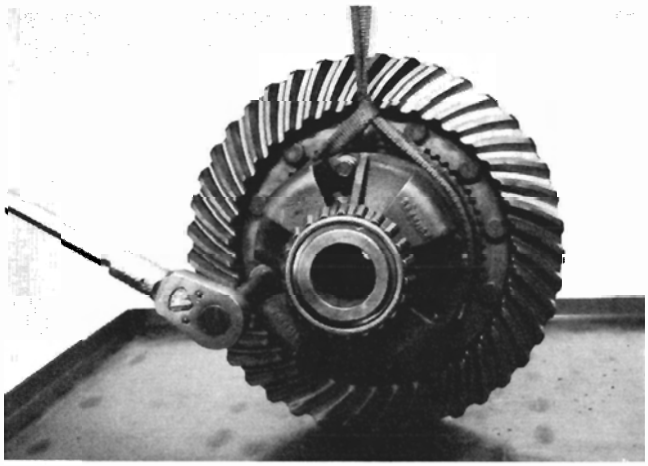


Figure 21
Remove body bolts from plain half.

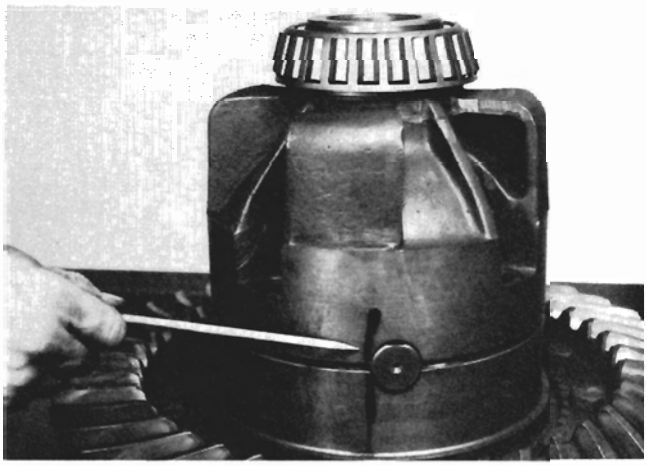


Figure 22
Mark plain and flange half case to insure correct reassembly.

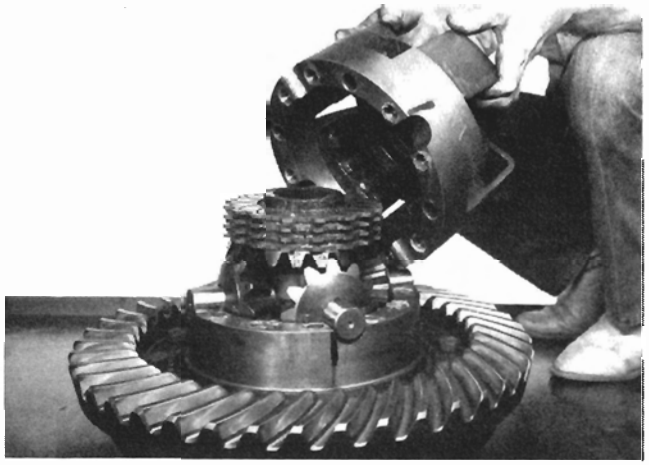


Figure 23
Remove plain half case.

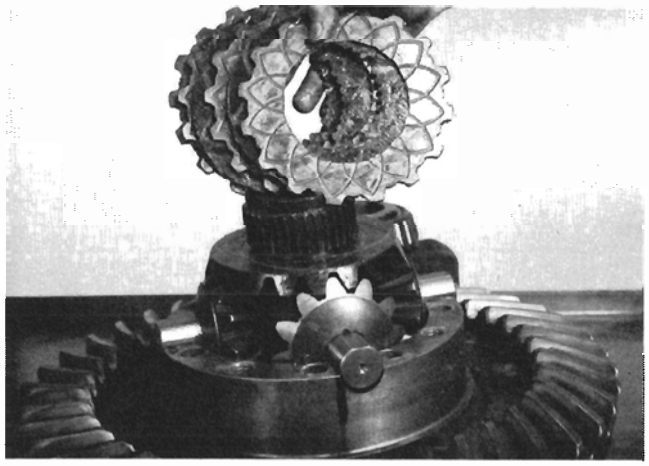


Figure 24
Remove inner and outer clutch discs.

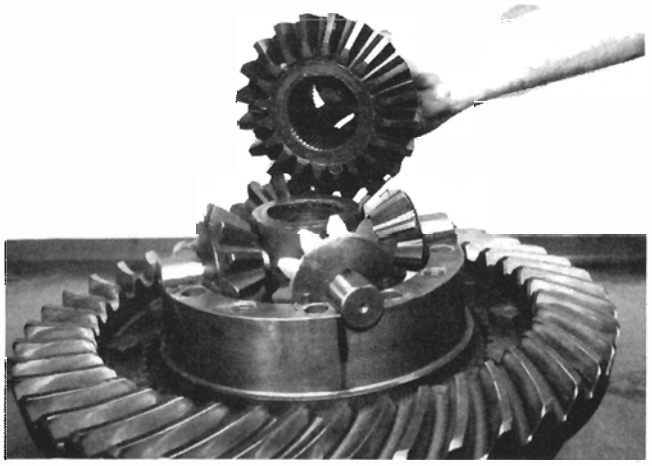


Figure 25
Remove side gear.

NOTE: If spring pack is not used proceed to Figure 33.

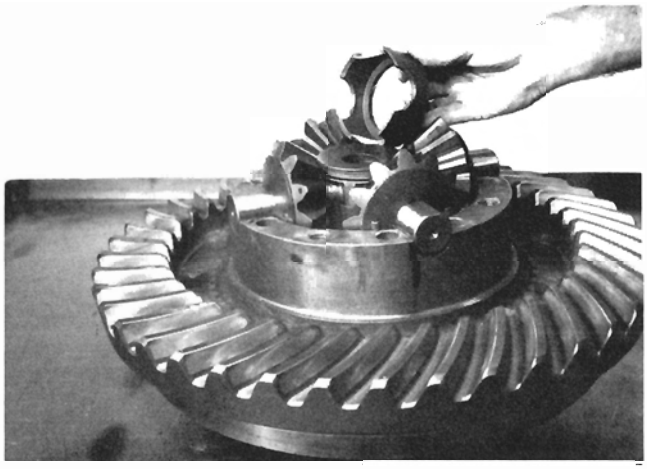


Figure 26
Remove thrust plate.

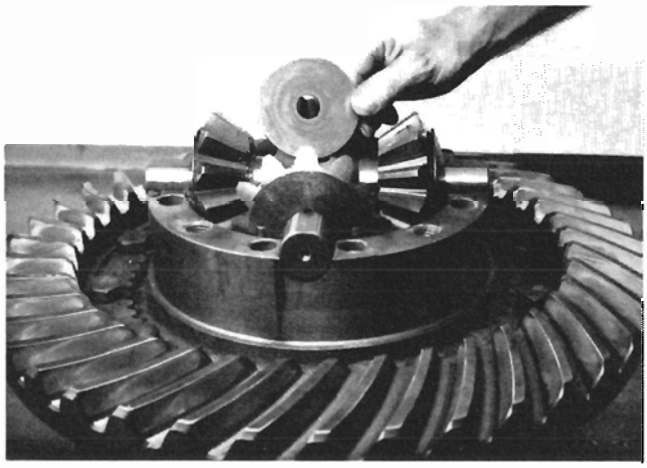


Figure 27
Remove spring pack spacer (not as shown).

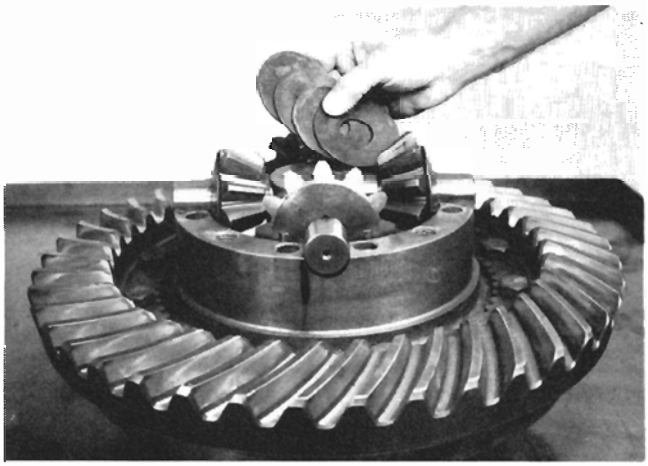


Figure 28
Remove spring pack.

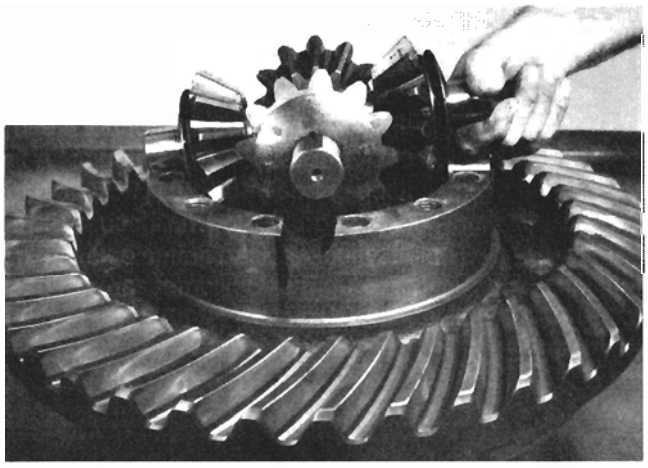


Figure 29
Remove differential pinions, washers and cross as an assembly. NOTE: There are two rows of needle rollers under each pinion gear. Do not lose these rollers.

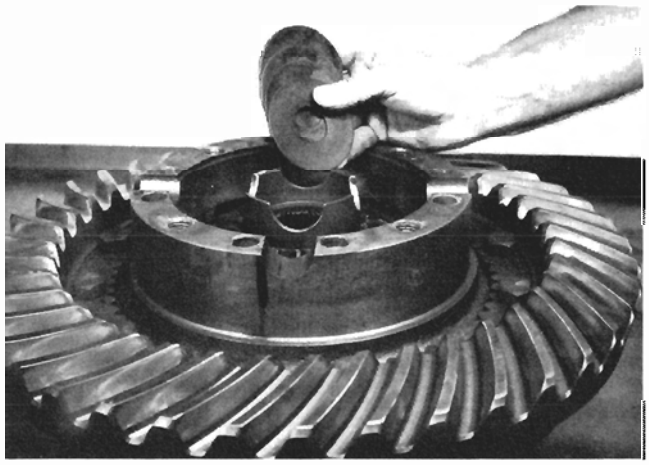


Figure 30
Remove flange half spring pack (see note after Figure 25).

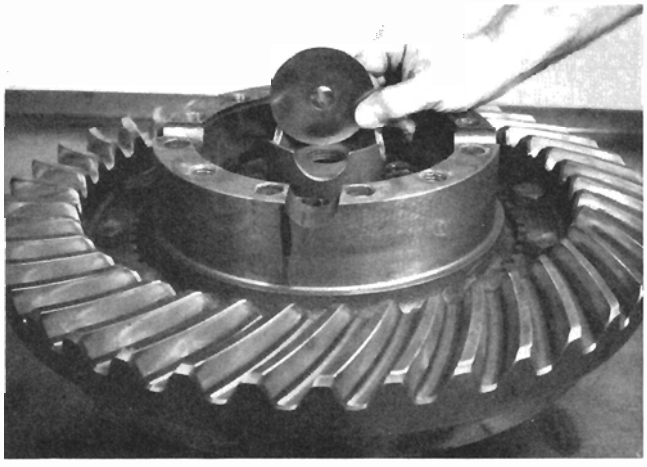


Figure 31
Remove spring pack spacer (not as shown).

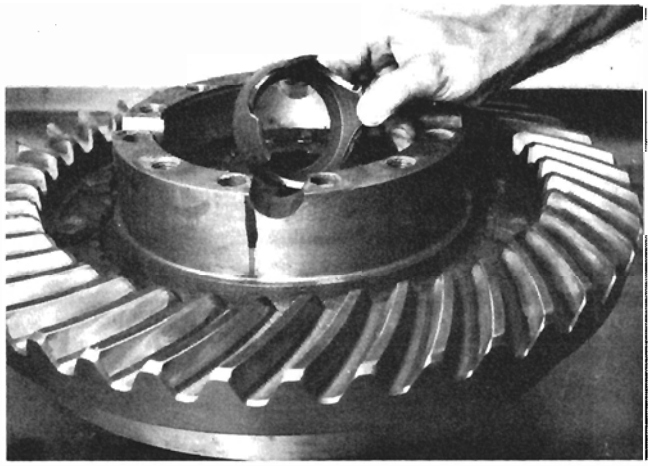


Figure 32
Remove thrust plate.

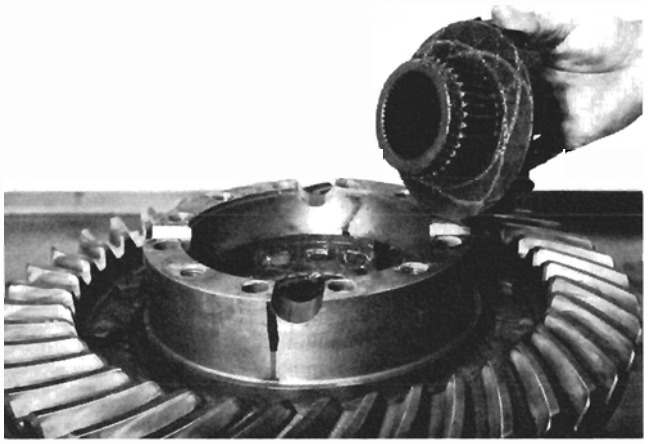


Figure 33
Remove side gear.

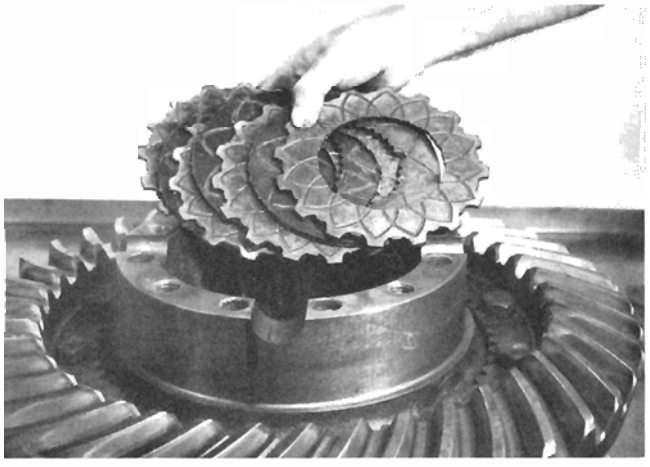


Figure 34
Remove inner and outer clutch discs.

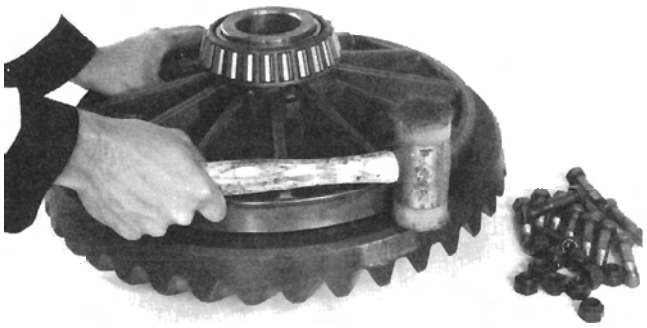


Figure 35

Remove ring gear bolts and nuts. Remove ring gear. If the plain or flange half case bearings are to be replaced, remove with a suitable bearing puller.

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.

CAUTION: Care should be exercised to avoid skin rashes, fire hazards, and inhalation of vapors when using solvent type cleaners.

Bearings

Remove bearings from cleaning fluid and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning. Do not spin bearings when drying. Bearings may be rotated slowly by hand to facilitate drying process.

Housings

Clean interior and exterior of housings, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

CAUTION: Care should be exercised to avoid skin rashes and inhalation of vapors when using alkali cleaners.

Thoroughly dry all parts cleaned immediately by using moisture-free compressed air or soft, lintless absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil or laping compound.

INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

Bearings

Carefully inspect all rollers, cages, and cups for wear, chipping, or nicks to determine fitness of bearings for further use. Do not replace a bearing cone or cup individually without replacing the mating cup or cone at the same time. After inspection, dip bearings in clean light oil and wrap in clean lintless cloth or paper to protect them until installed.

Oil Seals, Gaskets, and Retaining Rings

Replacement of spring loaded oil seals, gaskets, and snap rings is more economical when unit is disassembled than to risk premature overhaul to replace these parts at a future time. Loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed. Cutting, scratching, or curling under lip of seal seriously impairs its efficiency. At reassembly, lubricate lips of oil seals with E.P. Multi Purpose Grease, Grade # 2.

Gears and Shafts

If magna-flux process is available, use process to check parts. Examine teeth and ground and polished surfaces on all gears and shafts carefully for wear, pitting, chipping, nicks, cracks, or scores. If gear teeth are cracked or show spots where case hardening is worn through, replace with new gear. Small nicks may be removed with suitable hone. Inspect shafts to make certain they are not sprung, bent, or splines twisted, and that shafts are true. Differential pinions and side gears must be replaced as sets. Differential ring gear and bevel pinion must also be replaced as a set if either is damaged.

Housing and Covers

Inspect housing, covers, planet spider, and differential case to be certain they are thoroughly cleaned and that mating surfaces, bearing bores, etc., are free from nicks or burrs. Check all parts carefully for evidence of cracks or conditions which would cause subsequent oil leaks or failures.

At reassembly apply thread locking compound where noted.

Guidlines for application where to apply.

A. On bolts, cap screws, and studs (anchor end) apply compound on female threaded component part.

B. On nuts, apply compound to the male thread of the mating fastener.

C. Apply compound to coat the full length and circumference of thread engagement.

D. Remove excess compound from mating parts after fastener installation.

DIFFERENTIAL REASSEMBLY

NOTE: All parts must be lubricated with Clark recommended axle lubricant when reassembling. No part should be reassembled dry.

PINION SHAFT AND BEARING CAGE REASSEMBLY

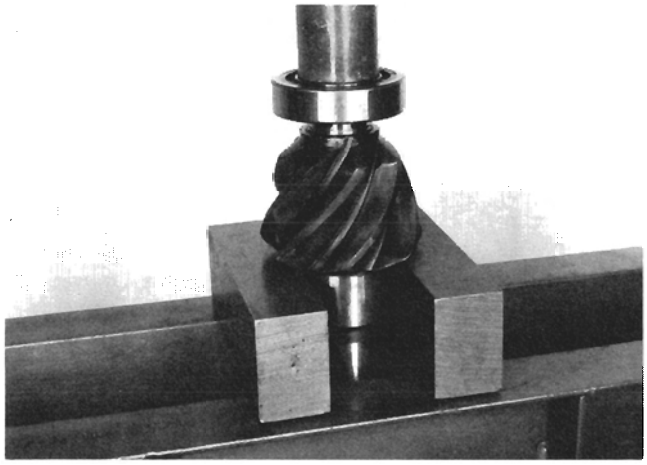


Figure 36
Press inner pinion bearing on pinion shaft.

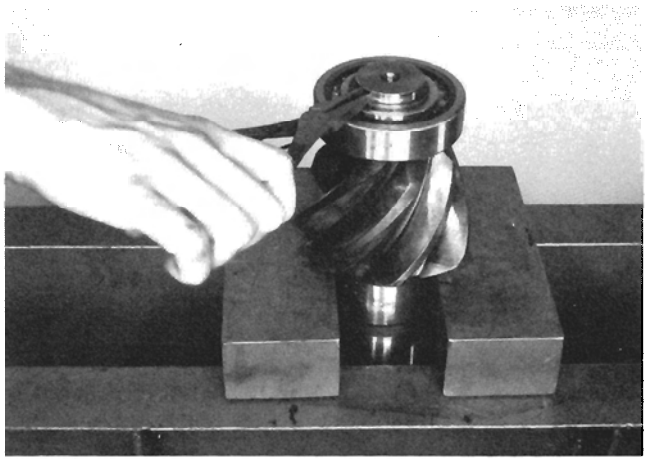


Figure 37
Install inner bearing to pinion shaft retainer ring.

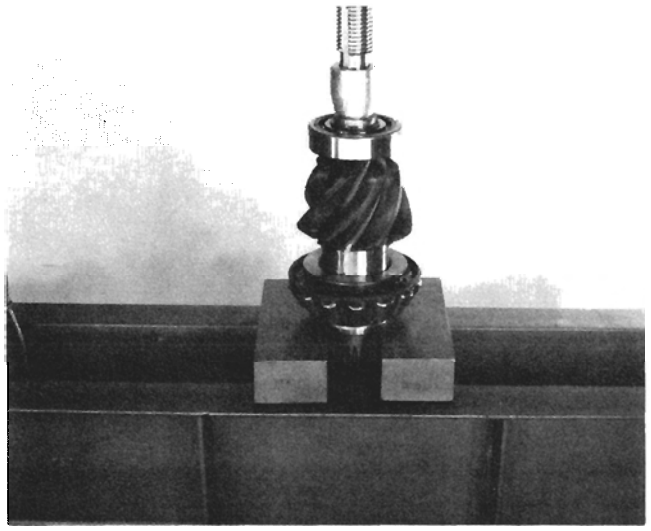


Figure 38
Press center taper bearing on shaft with large diameter of taper toward pinion gear.

NOTE: A pinion bearing spacer and shim kit is provided for repair of carrier assemblies. This kit consists of two spacers and quantity of shims. If pinion, pinion bearings, or housing was not changed use original bearing spacer for reassembly.

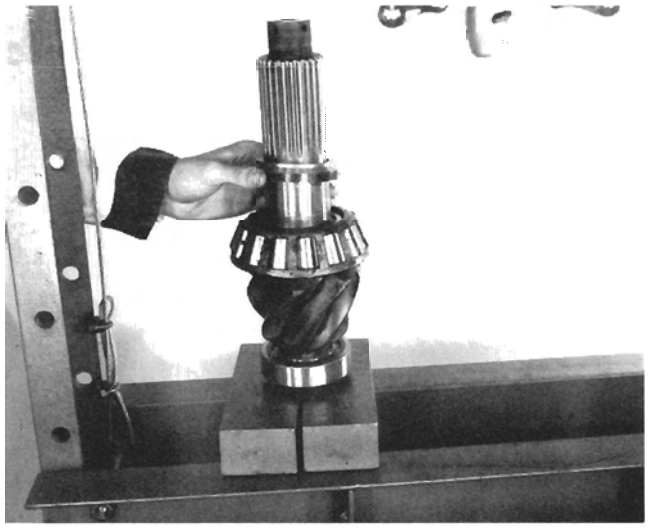


Figure 39
Install pinion bearing spacer and one .010 [0,254 mm] shim.

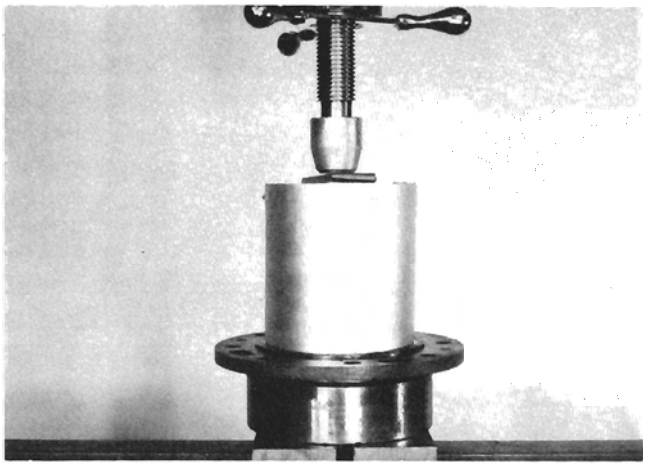


Figure 40
Install inner and outer taper bearing cups in pinion bearing cage.

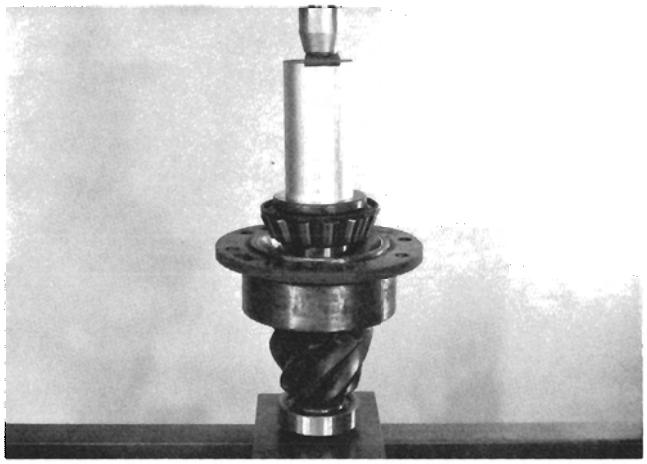


Figure 41
Position pinion bearing cage assembly on pinion shaft. Position outer pinion bearing cone on pinion shaft and press into place.

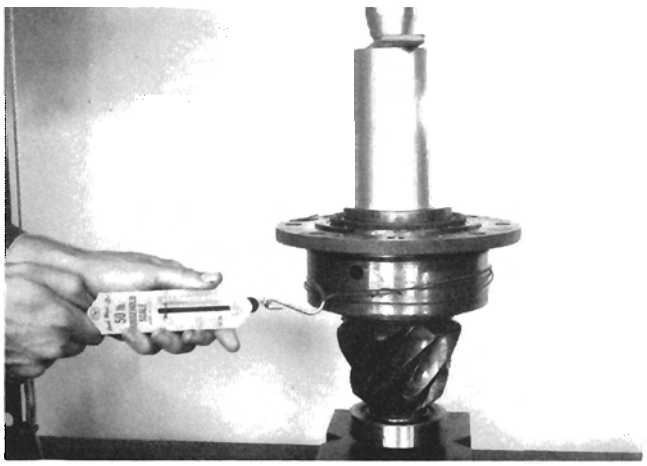


Figure 42
Keep pinion and cage assembly in press with approximately 500 pounds of press pressure exerted on driver. Wrap several turns of soft wire or cord around pinion cage and pull in horizontal line with spring scale. While pulling in straight line, (90 degrees from centerline of shaft), read spring scale and measure rotating torque. Multiply reading on spring scale by one-half diameter of bearing cage to obtain preload torque. Correct preload torque is 13 to 23 in. lbs. [1-3 N.m.]. If preload is not within these limits, remove shims to increase preload or add shims to decrease preload.

NOTE: This is a preliminary check. Final bearing preload check must be made with pinion shaft and bearing cage assembly in differential carrier housing.

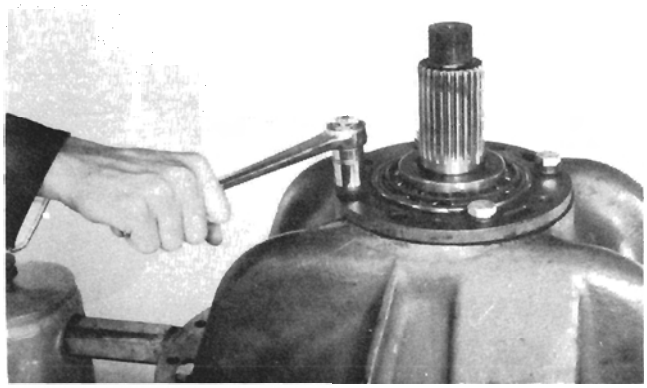


Figure 43
Install bearing cage and pinion shaft assembly in differential carrier assembly without bearing cage shims. Use four pinion oil seal retainer bolts with flat washers to pull pinion shaft assembly fully into carrier assembly. Make sure oil passages are aligned. Install three flat washers on each bolt to prevent them from bottoming.

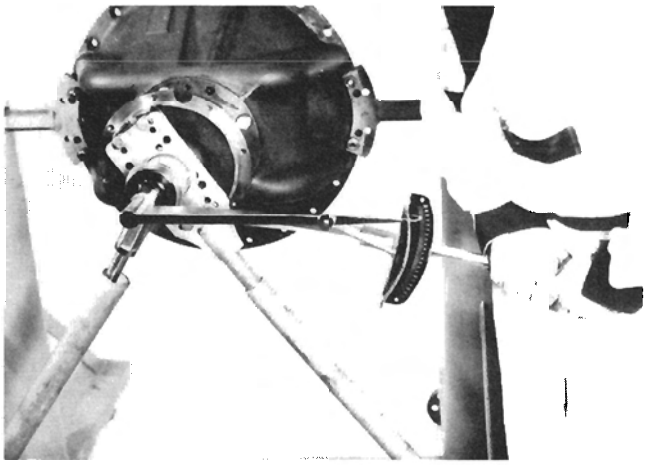


Figure 44
Temporarily install companion flange on end of pinion shaft without installing pinion oil seal retainer. Install companion flange retaining tool on companion flange and torque flange nut to 800 ft. lbs. [1084, 7 N.m.].

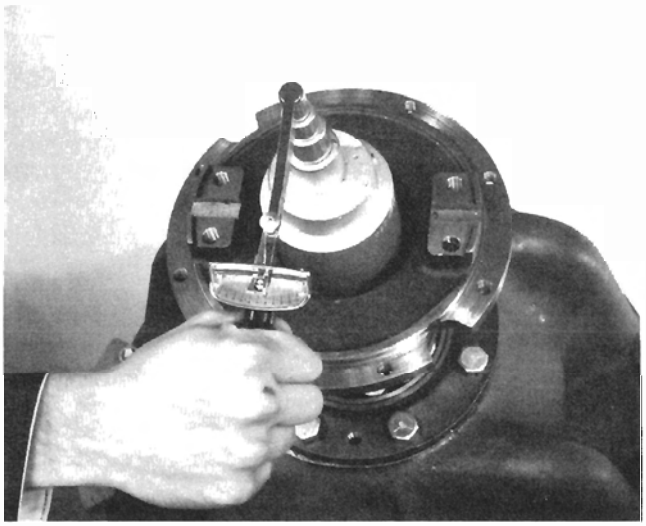


Figure 45

Remove companion flange retaining tool and use "inch-pound" torque wrench to check bearing preload. If bearing preload is not between 13 and 23 in. lbs. [1-3 N.m.], disassemble parts and add shims to decrease preload or remove shims to increase preload.

DIFFERENTIAL BODY REASSEMBLY

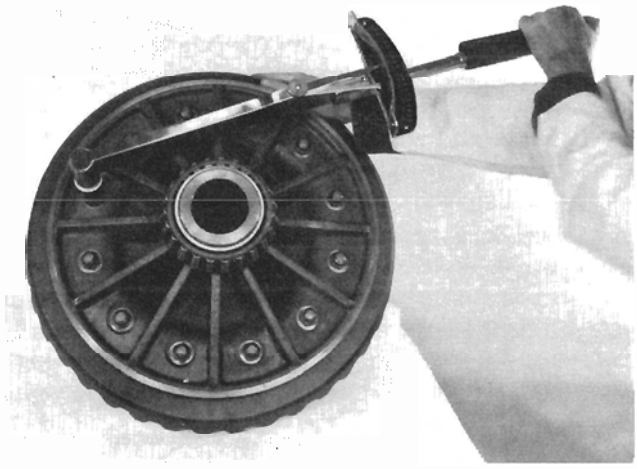


Figure 46

Check ring gear mounting surface of flanged half of differential case for burrs, being certain surface is smooth and clean. Install ring gear. Install bolts so internal diameter of ring gear prevents turning of hex head. Install ring gear bolt nuts and tighten 300 to 330 ft. lbs. torque [410-450 N.m.] for non-splined ring gear to non-slined half case. Tighten 125-140 ft. lbs. [170-190 N.m.] for splined ring gear to splined half case.

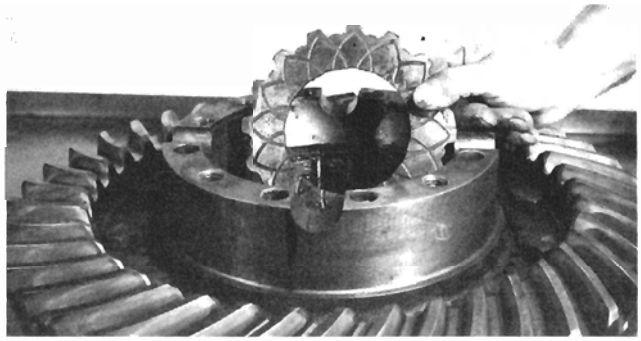


Figure 47

NOTE: Coat all clutch plates and side gear surfaces with Dow-Corning Molykote G-N Paste.

Install one (1) outer clutch plate (teeth on the outer diameter).

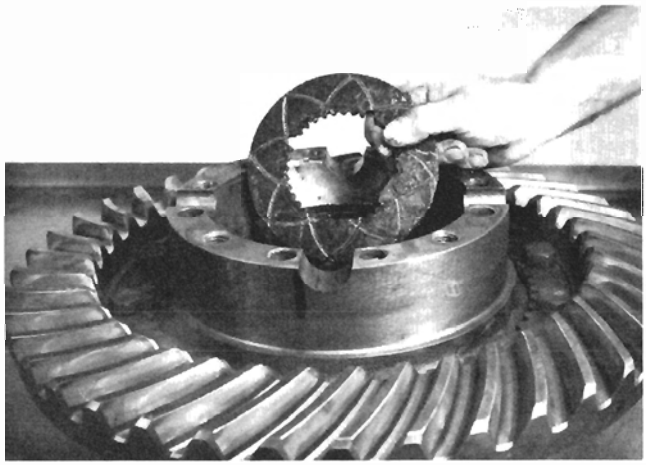


Figure 48

Install one (1) inner clutch plate (teeth on the inner diameter). Alternate inner and outer clutch plates until four (4) outer and three (3) inner plates are installed. You start with an outer plate and end with an outer plate.

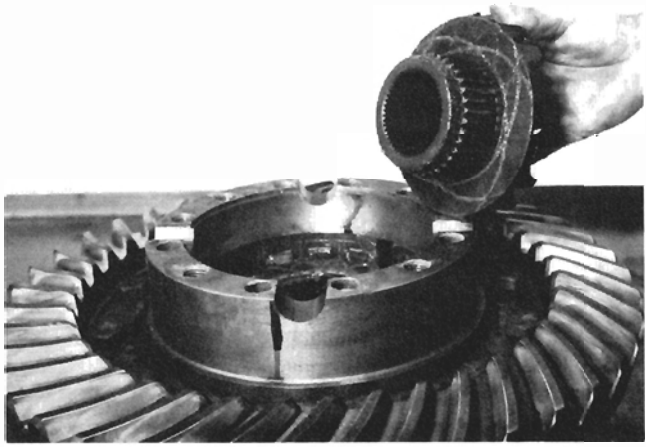


Figure 49

Install side gear, aligning outer splines with inner clutch plate splines.

NOTE: If spring pack is not used proceed to Figure 54.

NOTE: A check must be made to determine the distance between the side gear and the flat surface of the half case. This distance is the "A" dimension shown in Figure 50. A 1000 lbs. force [4448 N.m.] must be applied to the side gear to flatten the clutch plates. A press can be used, or as shown in Figure 50, a ½"-13 [12, 7 mm] bolt and ½" [12,7 mm] thick washer top and bottom are used. Install as shown and tighten nut 30 to 50 ft. lbs. torque [40,7-67, 7 N.m.]. This is equivalent to 1000 lbs. [4448 N.m.] force. A flat bar is used to support the depth micrometer. Measure the distance as shown and subtract the thickness of the support bar to get dimension "A." If dimension "A" is between 1.4510 and 1.4605 [36,856-37,096 mm] use a .0650 thickness spring pack spacer. If dimension "A" is between 1.4606 and 1.4710 [37,099-37,363 mm] use a .0750 [1,905 mm] spring pack spacer. This procedure is used on both flanged and plain half cases. Keep selected spring pack spacer with its respective half case for reassembly. See Figure 50 for flanged half case and Figure 65 for plain half case.

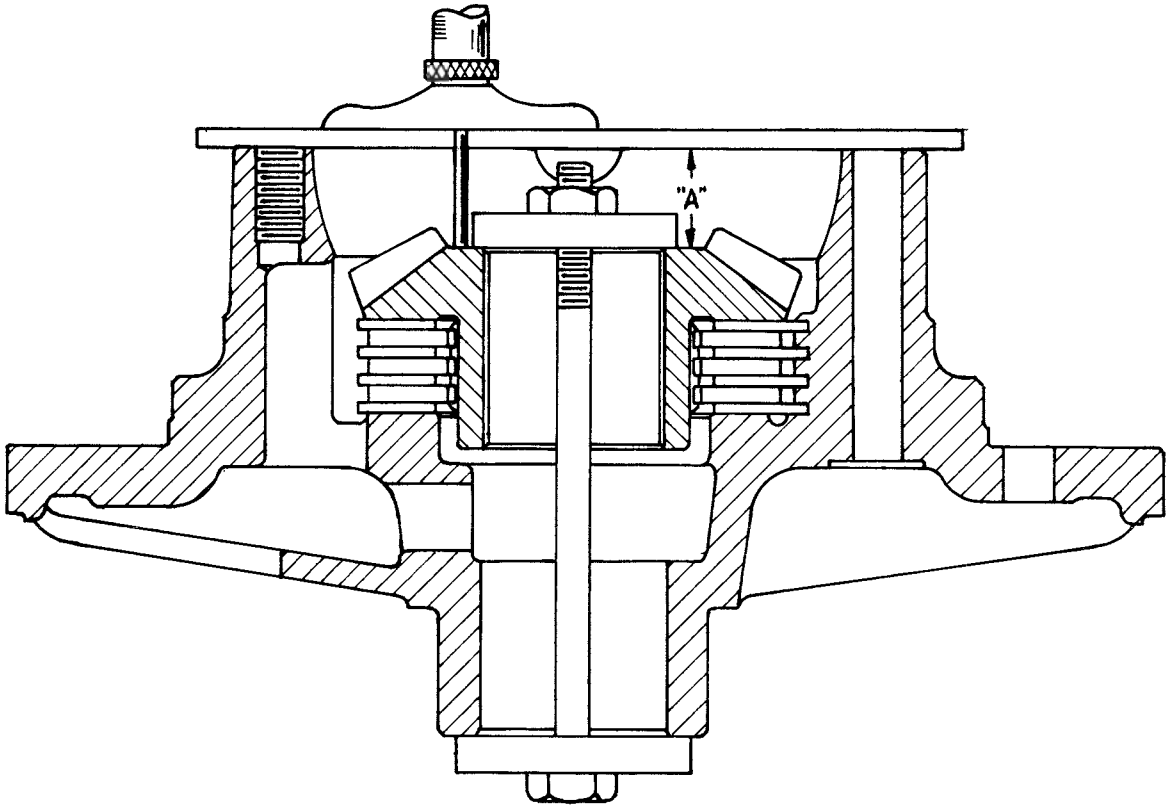


Figure 50

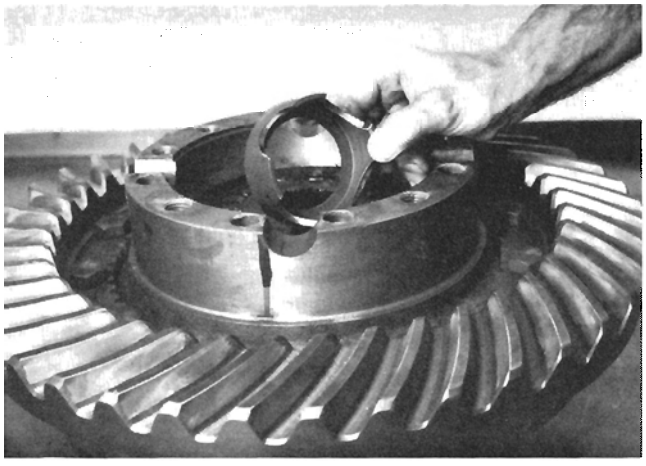


Figure 51
Install spring pack thrust plate.

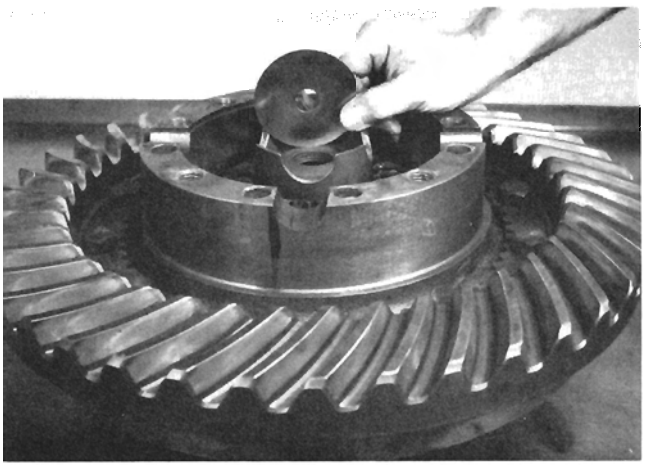


Figure 52
Install **selected** spring pack spacer.

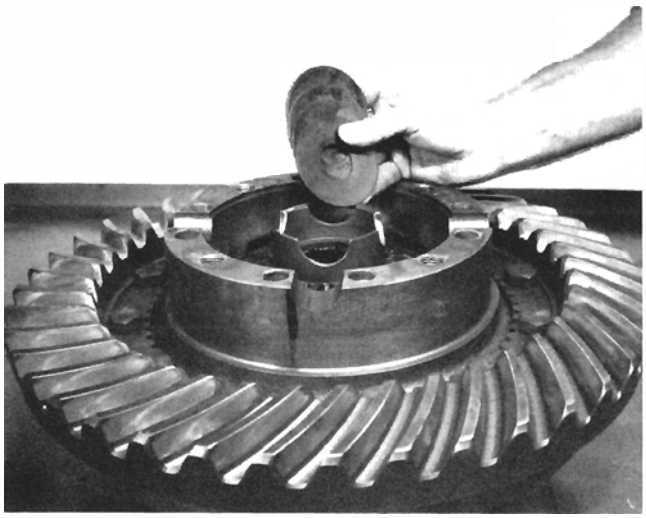


Figure 53
Install spring pack with all bevels in the same direction and with the large diameter of the bevel against the spring pack spacer.

NOTE: Four (4) springs per pack.

DIFFERENTIAL PINIONS, NEEDLES, AND CROSS REASSEMBLY

NOTE: All parts must be lubricated with Clark recommended axle lubricant when reassembling. No part should be reassembled dry.

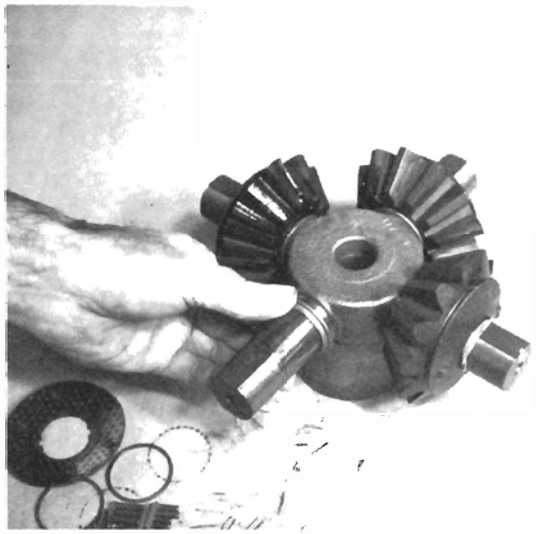


Figure 54
Position inner needle roller bearing spacer on differential spider. See Figure 60 for cross section reference.

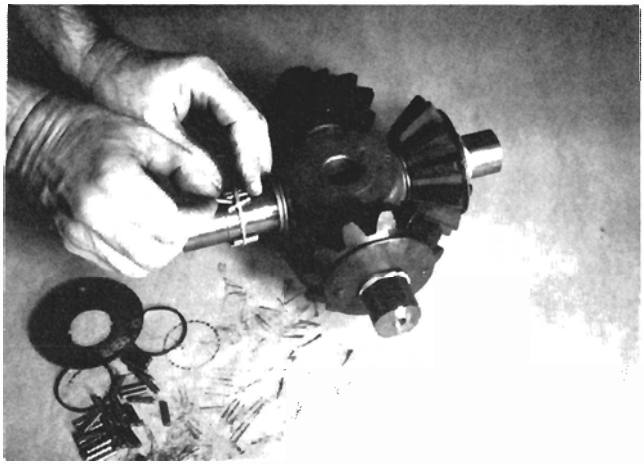


Figure 55
Using a rubber band to facilitate reassembly, install one row of needle roller bearings.

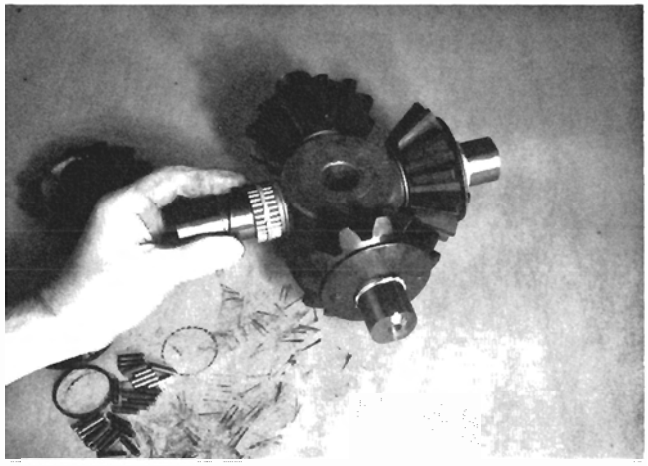


Figure 56
Install center roller bearing spacer.

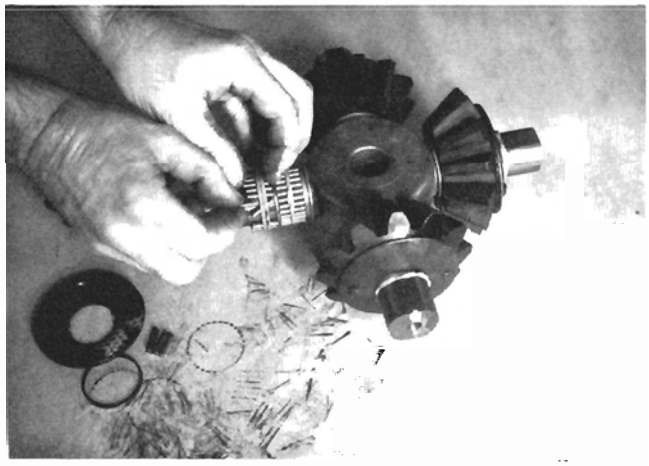


Figure 57
Using another rubber band, install outer row of needle roller bearings.

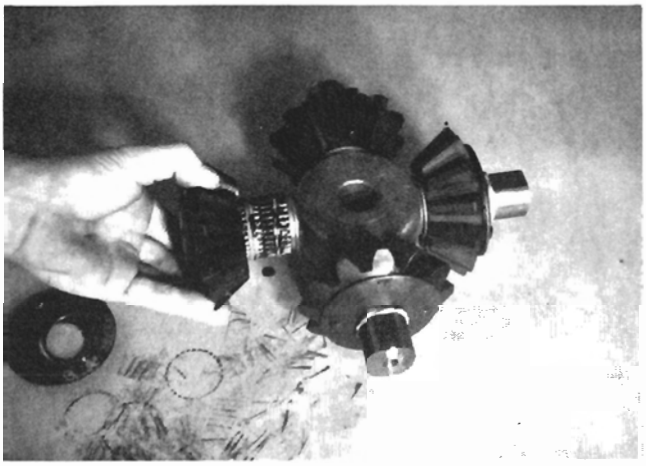


Figure 58
Position pinion gear on needles as shown. Remove first rubber band. Slide pinion gear over second row of needles, remove second rubber band.

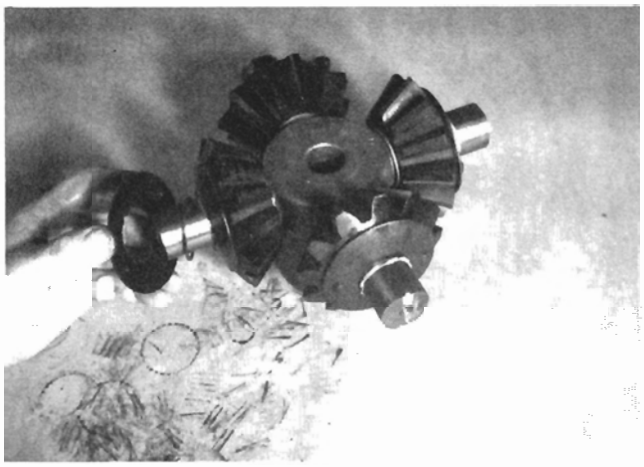


Figure 59
Install outer roller bearing spacer and pinion thrust washer. A rubber band was used on each end of the spider after pinion installation to keep pinion gear in place until assembly into flange half case.

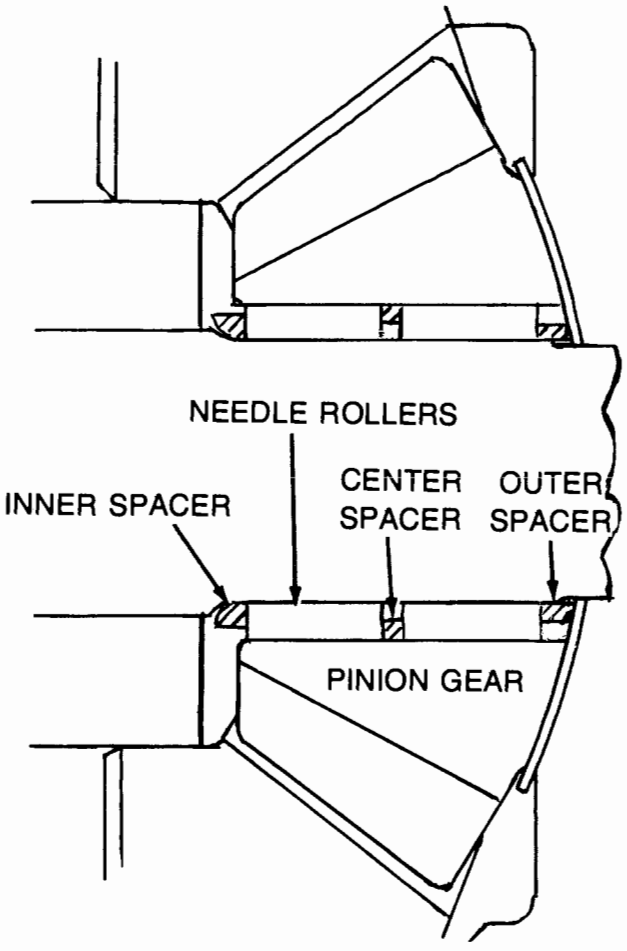


Figure 60

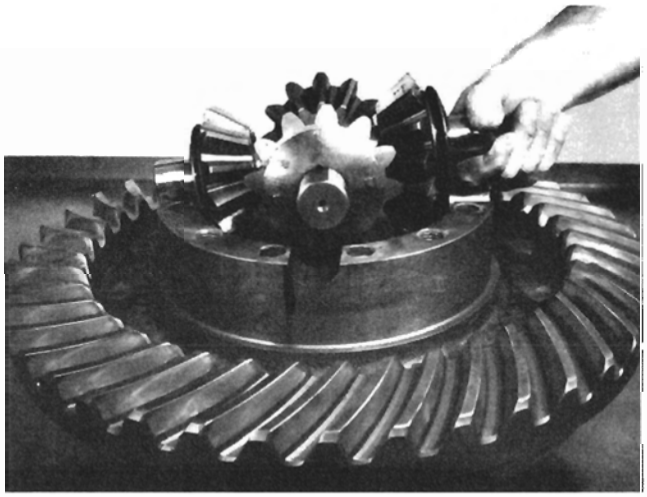


Figure 61
Remove rubber bands holding pinion gears into position on differential spider. Place spider assembly on side gear.

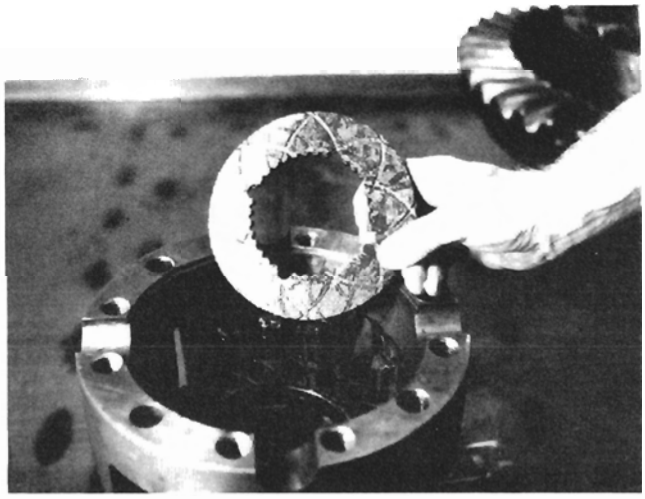


Figure 63
Install one (1) inner clutch plate (teeth on the inner diameter). Alternate inner and outer clutch plates until four (4) outer and three (3) inner plates are installed. You start with an outer plate and end with an outer plate.

See note after Figure 46.

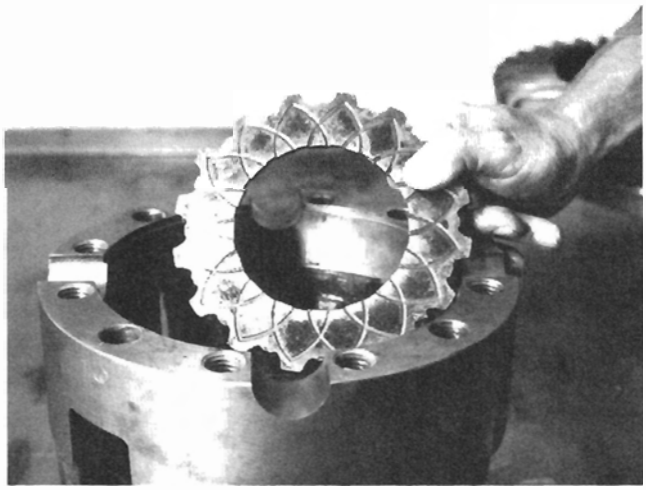


Figure 62
Install one (1) outer clutch plate (teeth on the outer diameter) in the plain half case.

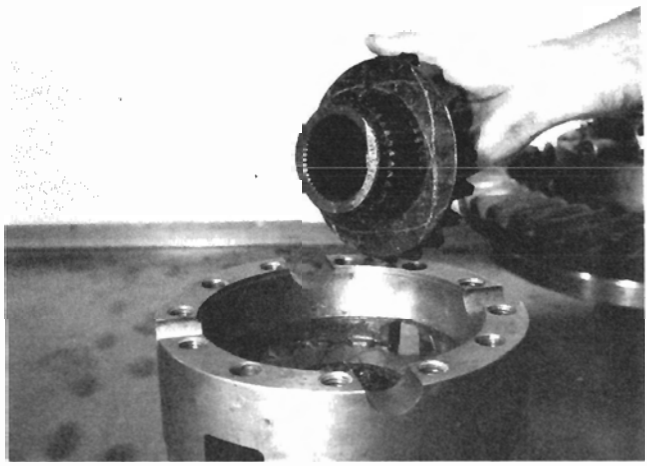


Figure 64
Install side gear aligning outer splines with inner clutch plate splines.

If spring pack is not used proceed to Figure 69. Use the same procedure explained in the note following Figure 49 for the plain half case clutch plate and side gear measurement to select proper spring pack spacer.

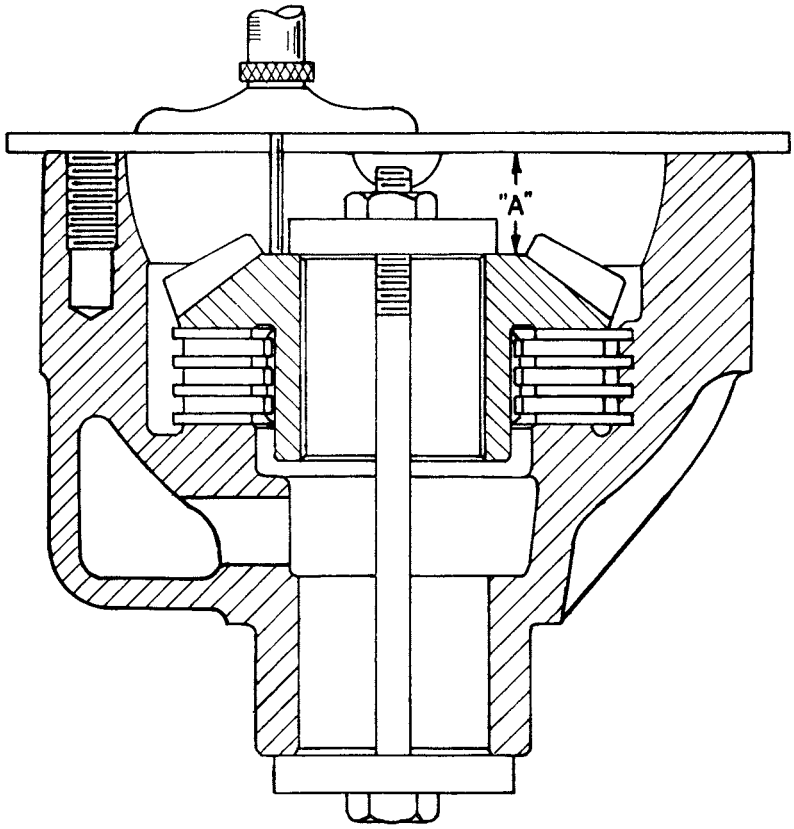


Figure 65

After the proper spring pack spacer is determined build up the plain half case parts on the flanged half case.

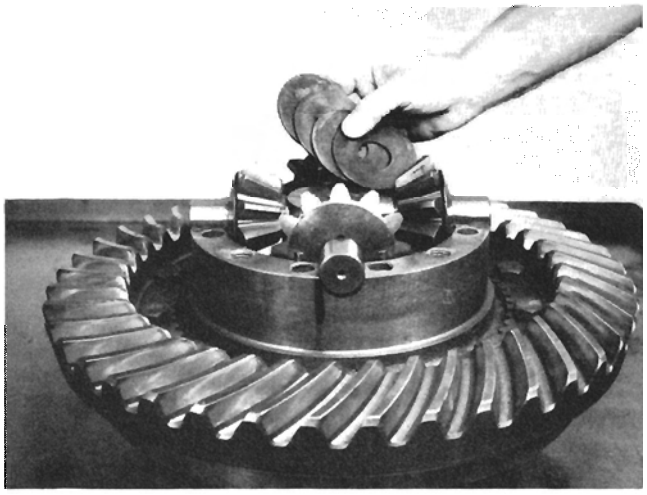


Figure 66

Install spring pack with all bevels in the same direction on the pinion cross. Note: large diameter of bevel up.

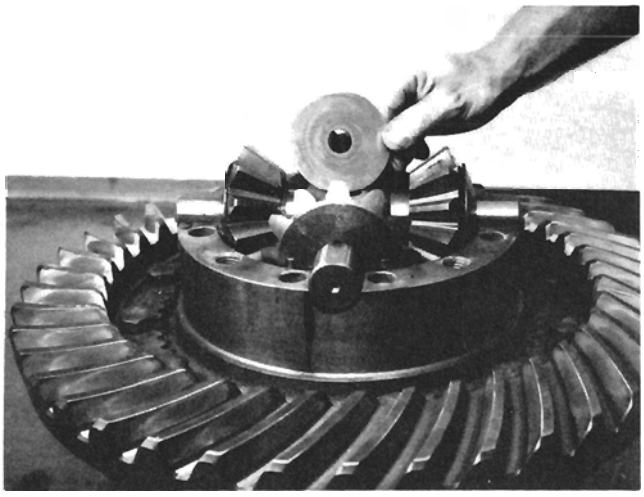


Figure 67

Install **selected** spring pack spacer on spring pack (not as shown).

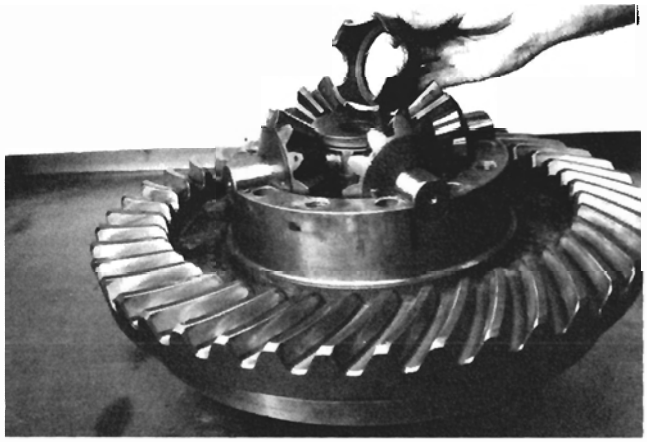


Figure 68
Install spring pack thrust plate.

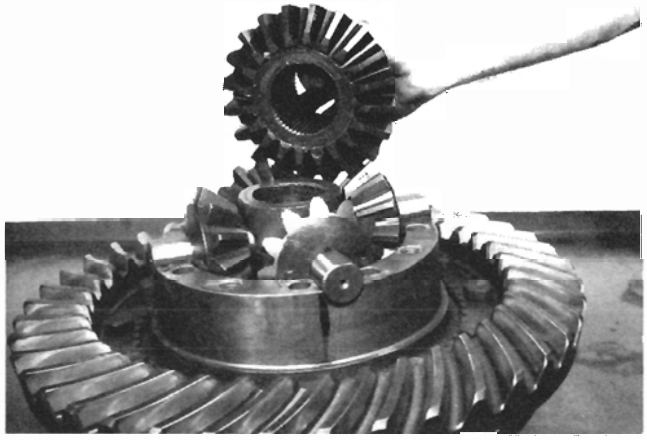


Figure 69
Remove side gear from plain half case. Position side gear on thrust plate.

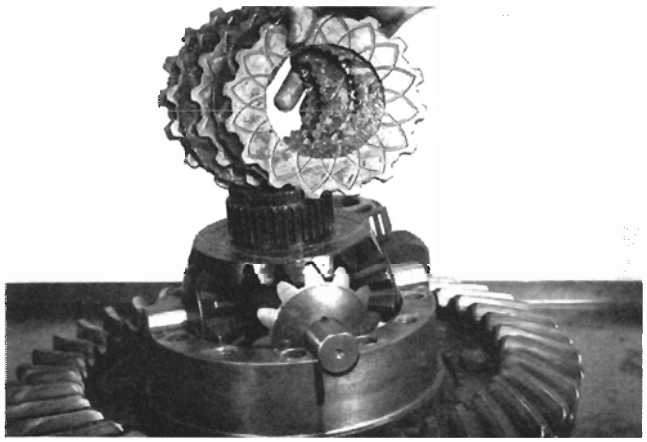


Figure 70
Install one (1) outer disc and one inner disc on side gear, alternate discs until a quantity of four (4) outer discs and three (3) inner discs are installed. Start with an outer disc and end with an outer disc. Align outer clutch disc teeth to facilitate assembly into plain half case. Apply Loctite # 262 to threaded holes in case halves.

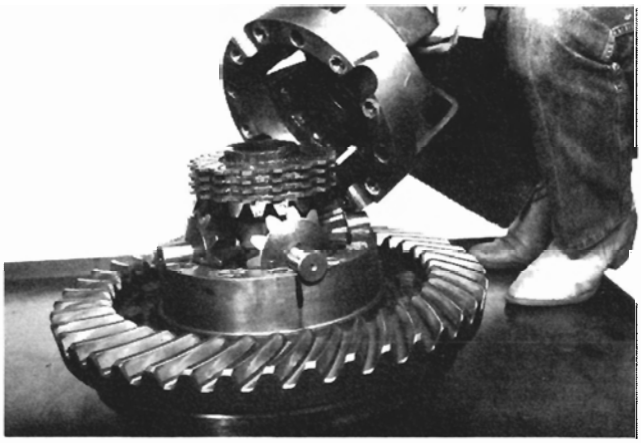


Figure 71
Align match mark on plain half case with mark on flanged half case. Install plain half case over clutch plates and side gear.

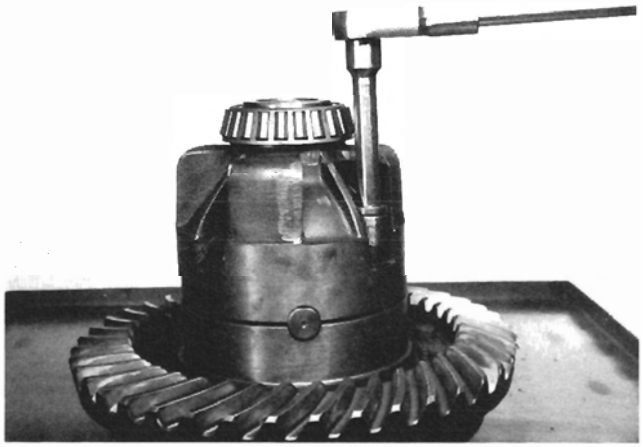


Figure 72
Install case half bolts and tighten 360 to 400 ft. lbs. torque [488,1-542,3 N.m].

RING GEAR TO PINION MOUNTING DISTANCE PROCEDURE

A pinion setting gauge must be used to achieve a precise mounting distance between the ring gear, differential carrier housing, and pinion.

The gauge should be used if either carrier housing and/or ring and pinion is changed.

The use of the gauge will determine the amount of shims to be used under the pinion bearing cage to achieve an exact mounting distance between the ring gear and pinion.

By using the gauge and adding the proper thickness of shims, an optimum tooth contact will be obtained.

Setting the ring and pinion mounting distance without the gauge will require a trial and error procedure. A shim must be installed under the pinion bearing cage and then the unit must be completely assembled per service manual instructions.

The procedure must be repeated until proper tooth contact is obtained.

The following procedure is used to achieve a proper ring gear to pinion mounting distance using a pinion setting gauge.

Locating position of the pinion as described will produce a proper tooth contact with the ring gear when it and the differential assembly are assembled and adjusted to proper backlash setting.

Pinon setting gauge can be purchased from Service Tools, 2013 4th Street, N.W., Owatonna, Minn. 55060. Kit No. VME 10004-2.

The function of the gauge is to measure the distance from the centerline of the differential bearing bores to the ground surface on the gear end of the pinion gear. This measurement, when subtracted from the value etched on the ring gear will indicate the size of the shim pack required to position the pinion gear in proper relation to the ring gear.

On the outer diameter of the ring gear, a ring gear to pinion mounting distance value will be etched, add .469 to it. (.469 is half the thickness of the gauge bar.) Record this value. This value may be different on each ring and pinion set due to manufacturing variations.

Use a file and emery cloth and remove all burrs and nicks from machined bearing surfaces of differential carrier housing.

Paint bearing surfaces of carrier housing with red lead or Prussian blue.

Insert a 4'' base 5/32 diameter extension depth micrometer (Starrett #44B-6RC and extension #99347 7'' or equivalent is recommended) into the guide bore of the micrometer arbor, slide clamps over base of micrometer. With the thumb screws reacting on base, secure micrometer.

IMPORTANT: The micrometer extension must pass freely through the micrometer bar guide bore and the base of the micrometer must rest on the micrometer arbor when mounted.

Mount adapter discs on micrometer arbor and set in position in carrier housing. Exercise care to be sure that micrometer and extension do not contact any part of the carrier in this operation. Apply pressure by hand and rotate adapter discs slightly to obtain a contact with bearing surfaces.

Remove checking gauge assembly and check for full bearing contact on bearing surfaces.

If contact is full and proper, again position checking gauge assembly in carrier and check distance to ground surface on pinion. Do not apply pressure to arbor or micrometer. Turn micrometer carefully and evenly until the flat tip of the micrometer extension contacts the ground surface of the pinion squarely. Subtract this reading from the value previously recorded and this equals the amount of shims to be added between the pinion bearing cage and the carrier housing.

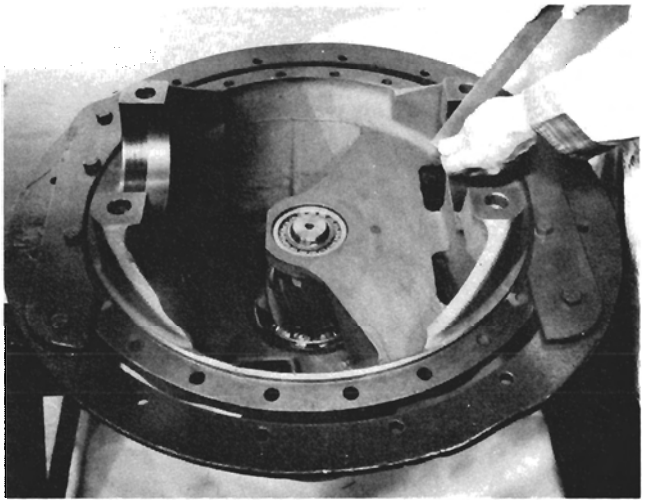


Figure 73
Use a file and emery cloth to remove all burrs and nicks from machined bearing surfaces of differential carrier housing.

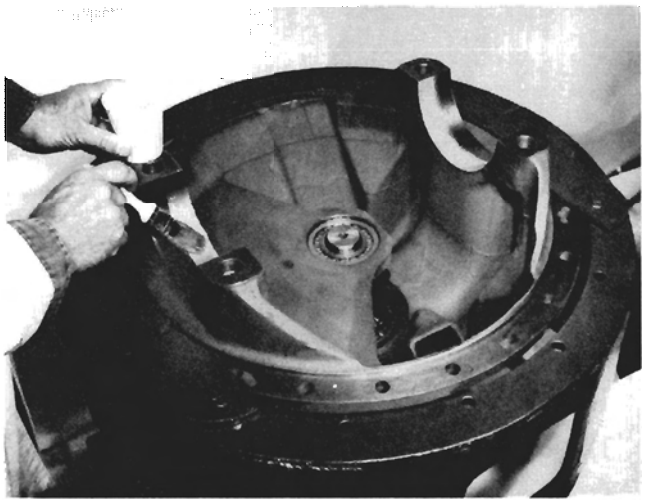


Figure 74
Paint bearing surfaces of carrier housing with red lead or Prussian blue.

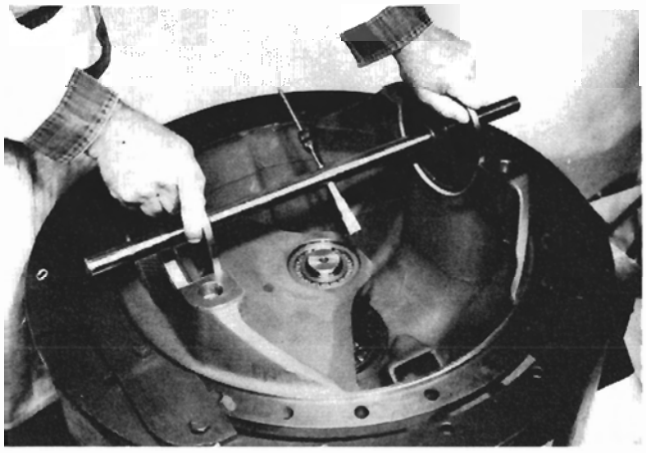


Figure 75

Mount adapter discs on micrometer arbor and set in position in carrier housing as shown in Figure 75. Exercise care to be sure that micrometer and extension do not contact any part of the carrier in this operation. Apply pressure by hand and rotate adapter discs slightly to obtain a contact with bearing surfaces.

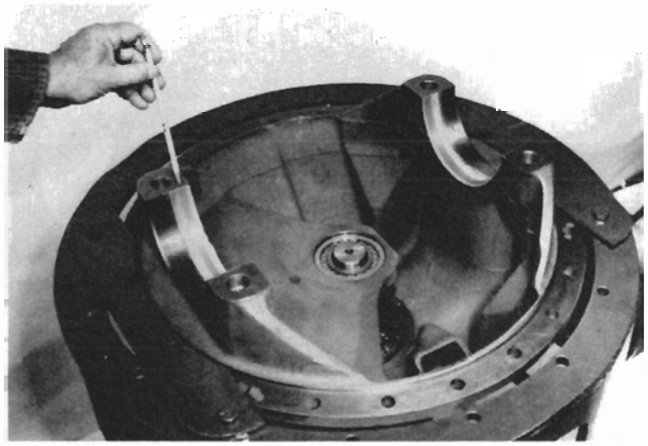


Figure 76

Remove checking gauge assembly and check for full bearing contact on bearing surfaces.

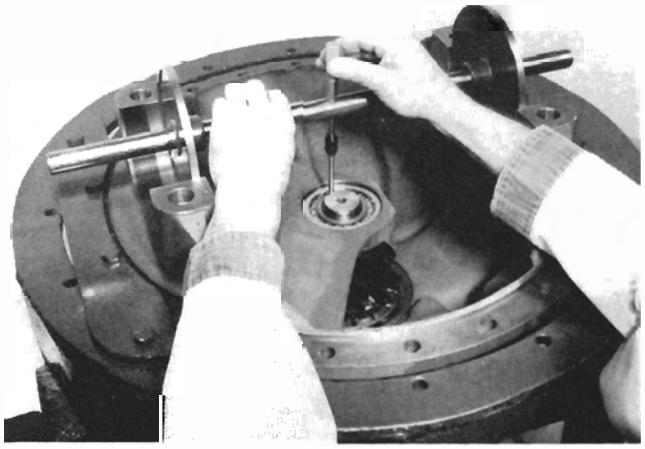


Figure 77

If contact is full and proper, again position checking gauge assembly in carrier and check distance to ground surface on pinion (Figure 77). **Do not** apply **pressure** to arbor or micrometer. Turn micrometer carefully and evenly until tip of extension contacts the ground surface of the pinion. In the assembly shown, the distance measures 5.728 inches, the reading on the micrometer being .728 inch. Subtract this reading from the value etched on the ring gear plus .469 (half the thickness of gauge bar) and this equals the amount of shims to be added between the pinion bearing cage and the carrier housing.

Example:

5.289 — Etched on ring gear
.469 — Half the thickness of the guage bar
5.758 — Total
5.728 — Initial micrometer reading
.030 — Add this value in shims

Remove bolts holding pinion bearing cage and pinion in differential carrier and remove bearing cage and pinion assembly. Install required shim pack and reinstall cage and pinion assembly in carrier. Tighten cage screws 125 to 140 ft. lbs. torque [170-190 N.m.] temporarily.

After adding required amount of shims, again mount checking gauge assembly and take a check reading. The reading should now be .758 (5.758 inches) plus or minus .002 inch. In other words, the reading should be equal to the value etched on the ring gear within .002 inch.

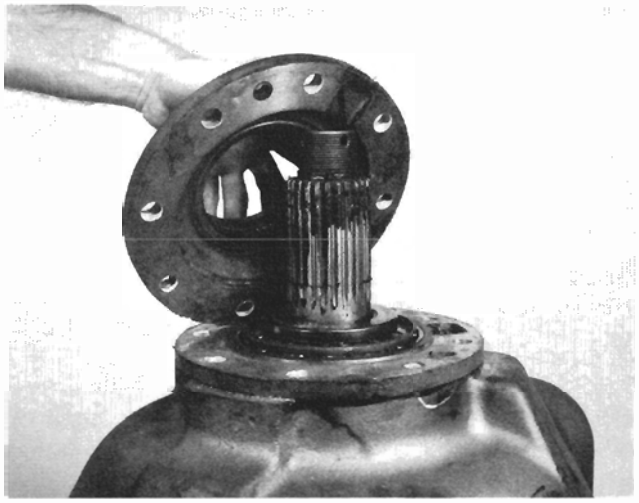


Figure 78

Remove bolts holding pinion cage in housing. Remove pinion and cage assembly. Apply Loctite #515 to shims and joining surfaces, reinstall pinion and cage assembly being sure all oil passages are aligned. Apply a light coat of Loctite #515 to the outer diameter of the pinion shaft oil seal. Press seal in retainer with lip of seal toward pinion bearing. Coat outer bearing cage surface with Loctite #515 and install oil seal retainer.

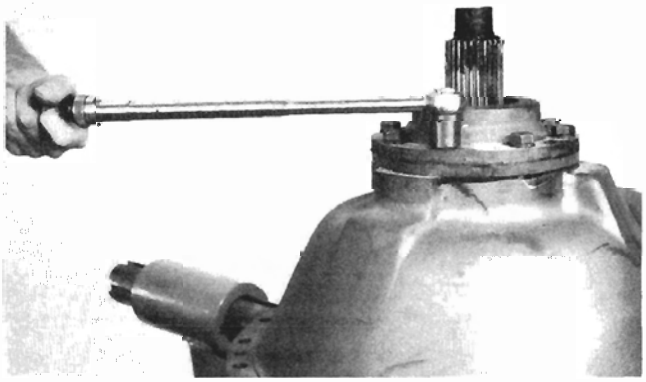


Figure 79

Apply Loctite #262 thread locking compound to threaded holes and install retainer bolts and washers. Tighten bolts 125 to 140 ft. lbs. torque [170-190 N.m.].

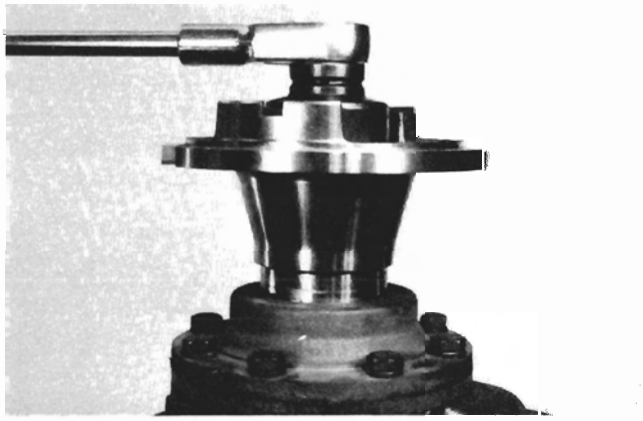


Figure 80

Apply Dow-Corning RTV-Q3-7069 Sealant to pinion spline locations shown on assembly instruction sheet, Figure C. Install flange, washer, and nut. Tighten nut to 800 ft. lbs. torque (min.) [1085 N.m.]. Tighten nut until cotter pin hole is exposed. Install nut cotter pin.

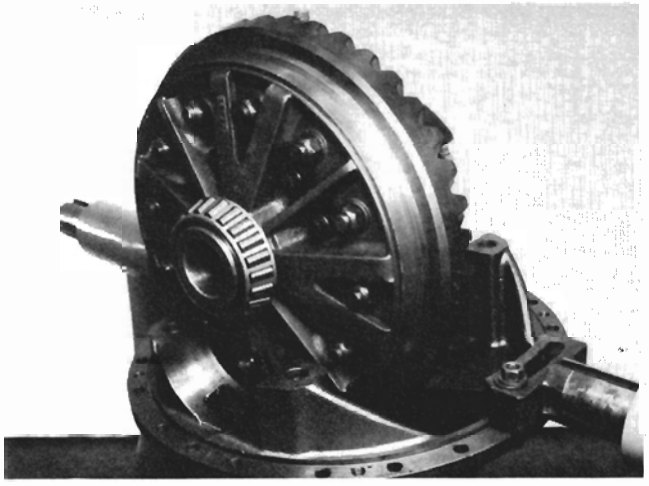


Figure 81

Position differential assembly into carrier.

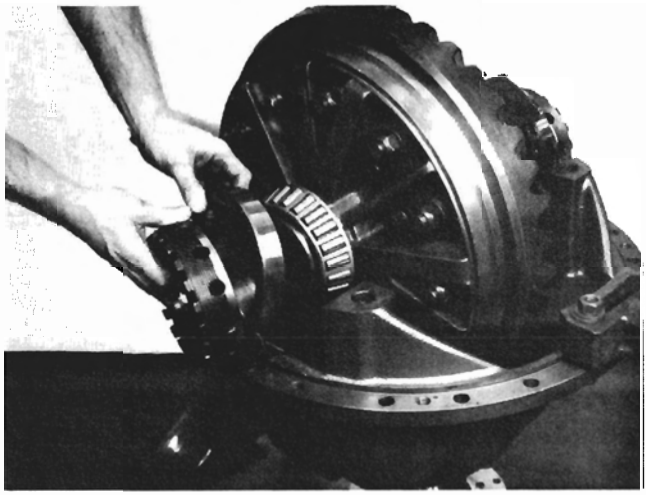


Figure 82

Position differential bearing cup and adjusting nut on one side of differential and lift slightly with hoist. Position bearing cup and adjusting nut on carrier. Repeat procedure and install opposite bearing cup and adjusting nut. Turn adjusting nuts by hand to be sure of proper thread alignment. Coat internal threads in housing with Loctite Sealer #262.

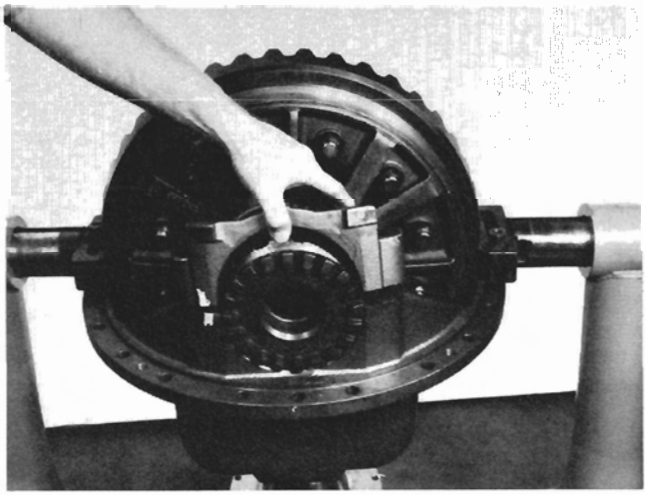


Figure 83

Position bearing caps on bearings and adjusting nuts, making sure match marks made during disassembly are properly aligned. Install cap bolts, and tighten lightly. Do not torque at this time.

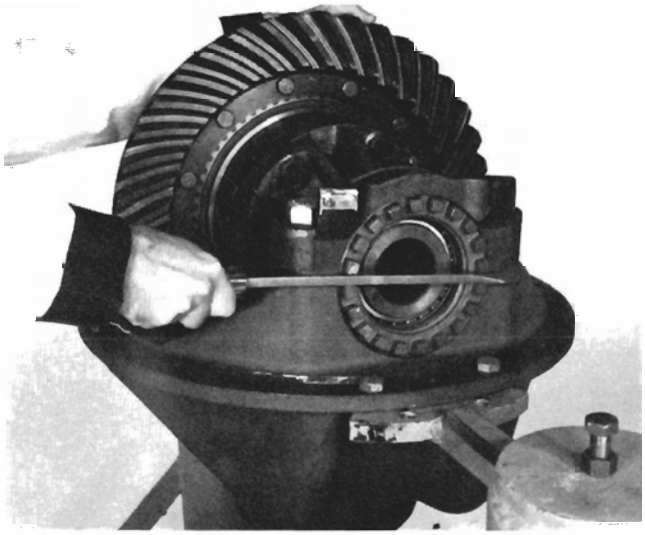


Figure 84

Tighten bearing adjusting nuts to adjust bearings to zero endplay.

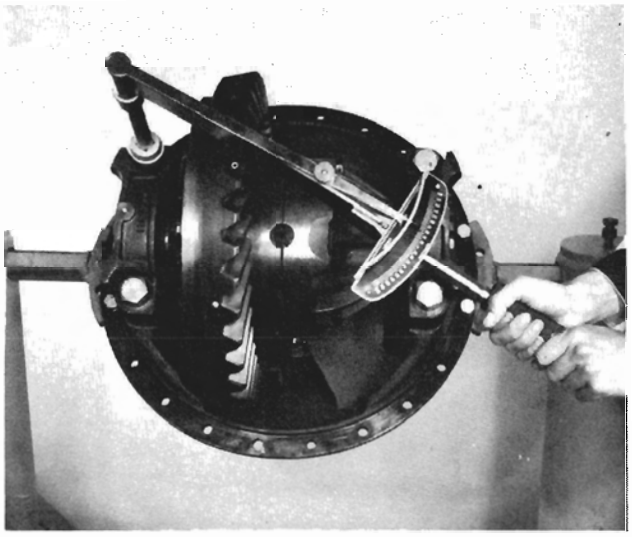


Figure 86

Tighten differential cap bolts 475 to 525 ft. lbs. torqu [645-710 N.m.]. Recheck ring and pinion backlash an bearing preload as explained in Figure 85 to be sur backlash is within specifications. Install adjusting nu lock and capscrews, tighten 40 to 45 ft. lbs. torqu [54-61 N.m.].

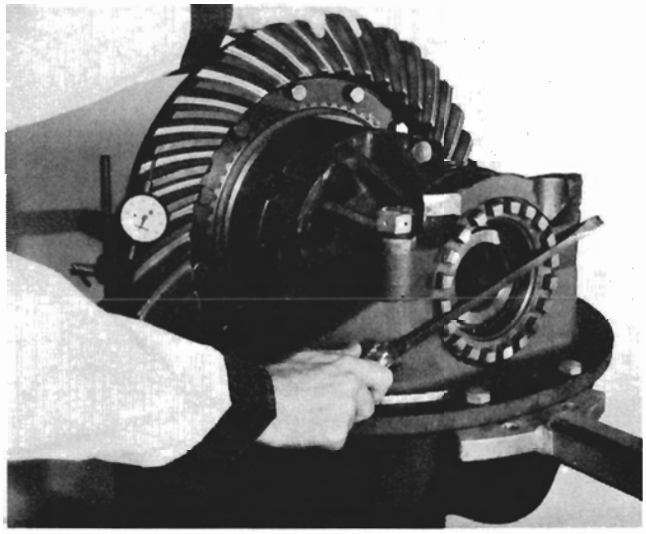


Figure 85

Use a dial indicator as shown. Move ring gear by loosening one adjusting nut and tightening opposite adjusting nut. Adjust position until gear backlash is to backlash specifications (see Figure C for new gear set), or adjust to backlash noted at disassembly for used gears. When proper backlash is achieved, tighten opposite adjusting nut to set preload on taper bearings. Using only thumb and forefinger, move ring gear. When ring gear becomes difficult to move, preload on bearing is set.

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